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ABSTRACT

Guidelines are presented for the preparation of abstracts of technical literature on instructional systems development (ISD). Although specifically created for abstracting information during the preparation of a technical data file on ISD, the guidelines are sufficiently general to apply to other areas in which abstracts of technical literature are desired. For abstracting purposes, the literature is divided into Type I and Type II documents. The first category includes opinion articles, methodological developments, evaluative summaries, literature reviews, and bibliographies. The second category is composed of statistical sampling studies, correlational research, and research studies in which variables are manipulated. Both types of abstracts are prepared on the same general form, a sample of which is provided, along with examples of both types of abstracts. The sample form is designed to permit the most important characteristics of a document to be synthesized in a manner which facilitates the computerization of the technical data file. (Author)

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AIR FORCE HUMAN RESOURCES LABORATORY

AFHRL-TR-74-13

GUIDELINES FOR ABSTRACTING TECHNICAL LITERATURE ON INSTRUCTIONAL SYSTEM DEVELOPMENT

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February 1974

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This technical report has been reviewed and is approved.

GORDON A. ECKSTRAND, Chief
Advanced Systems Division

Approved for publication

HAROLD E. FISCHER, Colonel, USAF
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sampling studies, correlational research, and research studies in which variables are manipulated. Both types of abstract are prepared on the same general form. A sample of the abstract form and examples of a completed Type I and Type II abstracts are included. The sample form permits the most important characteristics of a document to be synthesized to facilitate the computerization of the technical data file.

PREFACE

This report was prepared by Applied Science Associates, Inc. (ASA), Valencia, Pennsylvania, under Air Force Contract F33615-72-C-1884. The work described herein was accomplished under Project No. 7907, Conditions of Effective Training and Transfer. The project was administered by the Advanced System Division, Air Force Human Resources Laboratory. From contract initiation on 15 June 1972 through 31 December 1972, the Technical Monitor was Horace H. Valverde (now retired). Dr. Theodore E. Cotterman assumed the Technical Monitorship of the contract for the final months of the effort. Sanford P. Schumacher was the Principal Investigator.

This handbook is one of four reports prepared under the contract.* The guidelines in this handbook were used by the abstractors in preparing the abstracts which form the basis of a technical data file on instructional system development. The process of developing the technical data file is described in AFHRL-TR-73-41.

Section IV of this handbook is based upon the work of Payne, Munger, and Altman (1962). It is a direct modification of their guidelines for textual abstracting, and includes some direct quotations from their material.

The authors wish to express their gratitude to the many people who helped in developing the guidelines. Margaret Nesbitt and Zita Glasgow made many valuable contributions to the developmental activities. Abstractors including Sylvia Sue d'Ambrosi, Susan Koh, Gale Kornhauser, Jane Reynolds, Kathryn Sharretts, Ann Smith, and Elissa Weidaw provided valuable use-testing of the procedures. Special thanks are also due Susan Colwell and Jean O'Meara who helped with the difficult format and who typed and retyped the materials during their evolution.

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*The second technical report is: Schumacher, S. P., Pearlstein, R. B., & Martin, P. W. A comprehensive key word index and bibliography on instructional system development. AFHRL-TR-74-14. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, February 1974.

Schumacher, S. P., & Wiltman, S. A compendium of research and development needs on instructional system development. AFHRL-TR-74-15. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, February 1974.

The final technical report is: Schumacher, S. P. Development of a technical data file on the design and use of instructional systems. AFHRL-TR-73-41. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, December 1973.

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SECTION I

Introduction

Instructional System Development (ISD), as defined in the Air Force Manual 50-2 of the same name (Department of the Air Force, 1970) is "a deliberate and orderly process for planning and developing instructional programs which insure that personnel are taught the knowledges, skills, and attitudes essential for successful job performance." The following is a list of brief descriptions of the major ISD activities.

(1) Determine Job Performance Requirements (JPRs). The process of determining the tasks required of the human component, and the standard of performance. This process applies to all types of "jobs." It results in a statement of all human activities (skills, knowledges, and attitudes) required for successful performance.

(2) Determine Training Requirements (TRs). The process of determining the changes needed in skills, knowledges, and attitudes of personnel, so they can perform a job. These changes, when added to the entering repertoire of abilities, must meet the JPRs.

(3) Determine Criterion Objectives. The process of specifying the objectives which the student must meet to satisfy the TRs. Criterion objectives specify precisely what behavior is to be exhibited, the conditions under which behavior will be accomplished, and the minimum standard of acceptable performance.

(4) Develop Criterion-Referenced Tests. The process of developing and administering tests which directly measure the criterion objectives. The survey test is administered to samples of prospective students. The purpose is to verify which skills and knowledges to include in the course of instruction. Criterion-referenced tests (course criterion tests and diagnostic tests) are also developed to determine if the behaviors in the criterion objectives have been acquired.

(5) Select Media/Methods. The process of selecting appropriate media and methods for each block of instructional objectives. Selection is based on:

(a) Practical constraints (such as financial considerations)

(b) Instructional nature of the objectives (certain behaviors may be important in training, but not on the job)

(c) Presentation mode implied by the objectives (visual, auditory, etc.)

(d) Type of learning involved (for example, simple visual discrimination; chain of skilled performances)

(e) Best instructional sequence for the objectives

(6) Develop Instructional Materials. The process of developing and integrating the actual materials which make up the instructional regimen.

(7) Validate and Revise Instructional Materials. The process by which each unit of instruction is tested (validated) as it is developed. This process insures that criterion objectives are satisfied. First, materials are tested on several individuals and revised as necessary. Then, they are tried out on small groups of students, carefully sampled from the potential student population. Final revisions are made.

(8) Conduct Instructional Program. The process of implementing and administering the instructional program. This includes training of instructors and scheduling as well as the actual conduct of the program.

(9) Evaluate Instructional Program. The process of determining the extent to which graduates of the instructional program satisfy the performance requirements in the job environment. Detailed records of graduate performance are kept, and changes to the instructional program are recommended as necessary.

The technology of ISD has advanced significantly since 1950. A large body of literature relating to all aspects of the developmental process has emerged in the past 20 years. However, only for selected purposes, and then not comprehensively, has the literature been synthesized for use by practitioners. With the information explosion, it is virtually impossible for users to assimilate what has been accomplished in the past, much less to keep up with the technology. Hence, the need for a technical data file that permits synthesis of the information relevant to ISD.

The technical data file has been designed to satisfy the needs of Air Force users. Instructors and other personnel of all Commands who have

responsibility for course development will be the primary and typical users. Air Force Research personnel who are investigating methods for improving the instructional development and implementation processes will also use the file.

This handbook presents guidelines for abstracting the technical literature relevant to ISD. These guidelines, although specifically developed to apply to that abstracting necessary for the creation of a technical data file on ISD, are general enough to apply in many situations where abstracts of technical literature are desired.

SECTION II

Types of Literature and Types of Abstracts

Types of Literature

Literature pertaining to ISD has been divided into two general categories according to the type of abstract that is used to summarize documents within those categories. The first category of literature consists of documents that are summarized descriptively (Type I Abstract), while the second category includes documents that are summarized informatively (Type II Abstract). Of course, to be included in either category, a document must concern one or more of the steps (e.g., determine instructional objectives) in ISD.

The first category includes opinion articles, methodological developments, evaluative summaries, literature reviews, and bibliographies. The second category includes statistical sampling studies, correlational research, and research studies in which variables are manipulated. The following is a list of brief definitions for each type of document:

1. Opinion Articles: Documents that present the author's educated opinion or untested theorizing.

2. Methodological Development Articles: Technical reports, technical notes, guidelines, and procedural notes concerning the modification of ISD-related methodology. Developments reported in this type of document may have been tried in a systematic fashion, based on prior research results, or may simply be suggestions.

3. Evaluative Summaries: Documents that summarize the knowledge in a specific subject area and that also present critical commentaries on the state-of-the-art for that subject.

4. Literature Reviews: Documents that present summaries of specific literature within a subject area and which do not necessarily include critiques of that literature (but often do).

5. Bibliographies: Bibliographies and annotated bibliographies of the literature in a specific subject area, presented as a separate document.

6. Statistical Sampling Studies: These documents include reports of survey, questionnaire, and interview studies in which the techniques of statistical sampling have been applied.

7. Correlational Research: Documents that report correspondence among variables based on correlation coefficients.

8. Research Studies in which Variables Are Manipulated: Documents that report research studies in which the researcher manipulated independent variables and recorded associated changes in the dependent variables.

Types of Abstracts

Two general types of abstracts will be prepared depending on the nature of the document being summarized.

Type I Abstract. Type I abstracts are prepared for opinion articles, methodological development articles, evaluative summaries, literature reviews, and bibliographies. Type I abstracts do not take the place of the document but summarize the contents sufficiently that a user of the technical data file can determine whether the original document would be appropriate for his needs. The interrelationships among topics and their relative emphases are noted. Within the confines of reasonable space limitations, items in the document which are of particular relevance for the instructional system designer (e.g., a short procedure for evaluating the effectiveness of CAI) are also noted.

Type I abstracts also include an evaluation of the documents' clarity, readability, and its unique contributions to the ISD process.

Type II Abstract. Type II abstracts are prepared for statistical sampling studies, correlational research, and research studies that manipulate variables. Type II abstracts are sufficiently detailed that a user of the technical data file need not go back to the original document unless he has a very detailed requirement such as actually replicating the research that was reported. Type II abstracts summarize (a) the problem posed by the investigation, (b) the method, (c) the results, and (d) the discussion/conclusions sections of the document.

The fifth major section of a Type II abstract is an evaluation* which includes a consideration of the validity, overall clarity, and appropriateness of the research design; a substantiation of the conclusions; and a statement about the relevance of the work for ISD.

*The statistical and design criteria for evaluating articles are based on those established by Campbell and Stanley (1966).

SECTION III

The Abstract Form

Examples of a completed Type I and Type II abstract are appended to this report as Appendixes I and II, respectively. Both types of abstract are prepared on the same general form. Portions of the form are appropriate to every abstract. Other parts are relevant only to particular documents with specific characteristics. On Pages 9 through 11, a blank Abstract Form is presented in which each of the major subsections is numbered. In the following paragraphs the numbered subsections are discussed.

Page 1 of Abstract Form

1. Sequence Number. The sequence number is assigned to identify the order of document acquisition.

2. Abstract Type. The abstractor checks off whether a Type I or a Type II abstract is being prepared.

3. Reference Information. This section is filled in by the typist based on the bibliographic reference cited by the abstractor on Page 2 of the Abstract Form.

4. General Search Terms. The general search terms are assigned by the abstractor after reviewing the article. These words will form the primary means of search for the abstracts. A large subset of the possible search terms is presented in Appendix IV, The Directory of General Search Terms. This directory will help abstractors use standardized terminology.

5. Unique Search Terms. Unique search terms, assigned by the abstractors, are words which are unique to the specific document. For example, they may be descriptions of major systems involved, trade names for particular types of media used or treated, new terms discussed at length in the document, or the names of authors dicussed in detail in the article.

6. Suggestions for Additional Research. Often the authors of documents will mention suggestions or implications for future research. These suggestions or implications are summarized by the abstractor as succinctly as possible.

7. Cross Reference. This section of the Abstract Form is filled out at a later date. It references the sequence numbers of closely related documents.

Page 2 of Abstract Form

8. Sequence Number. Same as number 1.

9. Bibliographic Reference. The bibliographic reference is cited by the abstractor. The American Psychological Association (APA) Publication Manual provides the standard formats for citations. Excerpts from the 1967 edition of this manual detailing the mechanics of citing references are included as Appendix III of this handbook.

10. Body of Abstract. The body of the abstract is prepared according to the guidelines in this handbook. It consists of a condensation of the document content.

11. Evaluation of Document. The evaluation is prepared according to the guidelines in this handbook.

12. Number of Pages, Number of References, Initials of Abstractor. These items, filled in by the abstractor, are self-explanatory.

Page 3 of Abstract Form

13. Sequence Number. Same as number 1.

14. Summary and Evaluation Form. The third page of the Abstract Form serves a four-fold purpose. First, the abstractor can use it as a convenient tool for summarizing a document by filling out the form while reading the article. The process of completing the form will furnish the abstractor with most of the information necessary to prepare a Type I or Type II abstract. Secondly, filling out the Evaluation Checklists portion of the form will provide the abstractor with a handy summary for writing the evaluation portion of the abstract. Thirdly, the form will furnish a handy capsule of the type of document, topics discussed, types and methods of research employed or discussed, and media and approaches to training discussed so that a user of the technical data file can assess in a glance the suitability of a document for his needs. Finally, the most important characteristics of the document are synthesized in one place, thus facilitating the computerization of the technical data file.

SEQUENCE NO. _____ (1)
ABSTRACT TYPE: I _____ II _____ (2)

ABSTRACT FORM

AUTHOR(S):

TITLE:

PUBLISHER:

REPORT NUMBER: DATE:

(3)

GENERAL SEARCH TERMS: (4)

UNIQUE SEARCH TERMS: (5)

SUGGESTIONS FOR ADDITIONAL RESEARCH: (6)

CROSS REFERENCE: (SEQUENCE NUMBERS) (7)

SEQUENCE NO. _____ (8)

BIBLIOGRAPHIC REFERENCE: _____ (9)

BODY OF ABSTRACT: _____ (10)

(Continue on Next Page)

EVALUATION OF DOCUMENT: _____ (11)

(NUMBER OF PAGES _____)
(NUMBER OF REFERENCES _____) (12)
(INITIALS OF ABSTRACTOR _____)

SUMMARY AND EVALUATION FORM

MSU/ERIC NO. _____ (13)

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are used for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

- If an item does not apply in any way, mark the NA box in the space to the left of the item.
- If a document fully satisfies an item criterion, mark the 1 box to the left of the item.
- If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.
- If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

If you rate an item 2 or 3, make a brief note on scratch paper describing the defect.

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

NA	1	2	3	Descriptive Summary of Content:
				1. Title of document describes contents.
				2. Headings and subheadings outline contents.
				3. Area of interest is delineated clearly.
				4. Reasons for dealing with this area are clear.
				5. Problem area is covered adequately.
				6. Approach to problem area is appropriate.
				7. Limitations of approach are covered.
				8. Important terms are defined.
				9. Relationship of this document to other relevant literature is stated.
				10. Reviews of research are clear and concise.
				11. Reviews of research specify designs analyzed.
				12. Graphs and tables are presented clearly.
				13. Conclusions are stated clearly.
				14. Conclusions are substantiated by evidence presented in the document.
				15. Conclusions are confined to the problem area discussed in the document.
				16. Implications for future research are logically formulated.
				17. Bibliography is properly organized and presented clearly.
				Clarity and Usefulness:
				18. Document does not refresh established principles.
				19. Document presents applications relevant to ISD.
				20. Document presents concepts relevant to ISD.
				21. Conclusions are important for ISD.
				22. Style of writing is appropriate for typical ISD users.
				23. Document is written clearly.
				24. Document is reasonably easy to follow and is not confusing.
				25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

NA	1	2	3	Introduction:
				1. Title of document adequately describes contents.
				2. Problem is stated clearly.
				3. Reasons for investigating problem are clear.
				4. Assumptions are stated clearly.
				5. Limitations of the study are stated.
				6. Important terms are defined.
				7. Relationship of the problem to previous research is clear.
				8. Previous research is reviewed adequately for author's purposes.
				9. Hypotheses are stated clearly.
				Method:
				10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
				11. Method of sampling is adequately described and is appropriate.
				12. Sample is adequately described as to size, location, age, and other relevant characteristics.
				13. Research design is described fully.
				14. Rationale for specific research design is adequately justified.
				15. Research design is best suited for solution of the problem.
				16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
				17. The effects of independent variables are not confounded with the effects of motivational variables.
				18. Control groups are appropriate for comparison with experimental groups.
				19. Independent variables are adequately specified. (Qualitative)
				20. Dependent variables are adequately specified. (Qualitative)
				21. Variables are operationally defined. (Quantitative, generally)
				22. Appropriate measures are selected for dependent variables.
				23. Experimenter manipulates what he says he manipulates.
				24. Conditions under which experiment was conducted are clearly specified and delineated in sufficient detail.
				25. Research design is free of other specific known issues.
				26. Data-gathering methods or procedures are described in sufficient detail to allow replication.
				27. Data-gathering methods or procedures follow from the research design, methods or procedures are appropriate to the solution of the problem.
				28. Data-gathering methods or procedures do not introduce artifactual biases into data.
				29. Researcher has set up appropriate steps to eliminate or control for experimenter bias and self-fulfilling prophecy.
				Results:
				30. Data-gathering methods or procedures are used correctly.
				31. Reliability of measuring instruments is established.
				32. Validity of measuring instruments is established.
				33. Appropriate methods are selected to analyze the data in accordance with those indicated by the research design.
				34. Methods used to analyze the data are used correctly.
				35. Results of the analyses are presented clearly.
				36. Graphs and tables are presented clearly.
				37. Only significant results are introduced as meaningful data.
				38. Confidence levels are stated clearly and if unusual, justified.
				39. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
				40. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.
				Discussion:
				41. Conclusions are stated clearly.
				42. Conclusions are substantiated by the evidence presented.
				43. Generalizations are confined to the population from which the sample was drawn.
				44. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.
				45. Inferential and interpretive conclusions are clearly specified as such.
				46. Inferential and interpretive conclusions are justified.
				47. Speculations, guesses, and theorizing are not presented as conclusions that follow from the data.
				48. Implications for future research are logically formulated.
				Clarity and Usefulness:
				49. Report is written clearly.
				50. Report is logically organized.
				51. Report is reasonably easy to follow and is not confusing.
				52. Tone of the report displays an unbiased, impartial scientific attitude.
				53. Report is of good overall quality.
				54. Report is of importance to the problem area.

14A

2. DOCUMENT X TOPIC PROFILE

14B

ISD Tasks No. (AFM 50-2)		Type I Abstract: Decision Aiding	Methodological Considerations	Evaluative Summary	Literature Review	Bibliography	Type II Abstract: Statistical Summary Study	Correlational Research	Research Study (Manipulative Var.)	Other	I or II
1	Determine Job (or Activity) Performance Requirements										
2	Determine Education or Training Requirements										
3	Determine Instructional Objectives										
3	Develop Tests										
4	Select Media Methods										
4	Develop Instructional Materials										
4	Validate and Revise Instructional Materials										
5	Conduct Instructional Program										
5	Evaluate Instructional Program										
	Other. Specify: _____										

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

14C

3A. COMMUNICATION MEDIA

Audio:
- Radio
- Tape Recorder
- Record Player
- Listening Lab

Visual:
- Numerical (Silent)
- Motion Picture or Repetitive Loop (Silent)
- Television
- Microform

Audio-Visual:
- Sound/Slide Projector
- Filmstrip (Sound)
- Television
- Motion Picture
- Motion Picture or Repetitive Loop

3E. VISUAL AIDS

Graphics:
- Charts
- Diagrams
- Graphs
- Illustrations
- Drawings
- Photographs

Exhibits:
- Cut-A-Plans
- Mockups
- Models

Projected Images:
- Opaque Projectors
- Overhead Transparencies
- Slides

3B. ENVIRONMENTAL MEDIA/AIDS

- Simulator
- Part-Task Trainer
- Whole-Task Trainer
- Procedures Trainer
- Games
- Role Play
- Sociodrama
- Operational Equipment

3F. METHODS OF INSTRUCTION

- Tutorial
- Lecture
- Recitation
- Discussion
- Demonstration
- Simulation
- Peer Training
- Team Teaching

3C. TUTORIAL MEDIA

- CAI/CMI
- Programmed Text
- Teaching Machine
- Learning Lab

3G. OTHER (SPECIFY)

_____

3D. MULTIMEDIA

_____

_____

_____

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

14D

4A. TYPE OF RESEARCH

- Basic
- Lab Study
- Applied
- Field Study

4B. METHOD OF RESEARCH

- Historical
- Descriptive
- Case & Field
- Developmental
- Causal-Comparative or "Ex Post Facto"
- Correlational
- True Experimental
- Quasi-Experimental
- Action
- Other. Specify: _____

(14)

The Evaluation Checklists (14-a) are completed as per the attached instructions. The ISD topics covered in the report are checked off in the column(s) corresponding to the type of document being reviewed (14-b). Next, the boxes beside all media and methods discussed in the article are blacked in (14-c). Finally, for Type II documents, types and methods of research employed are marked (14-d). Table 1 on Page 13 describes the nine basic methods of research listed under Method of Research (14-d) on the Summary and Evaluation Form (Isaac and Michael, 1971).

Table 1

NINE BASIC METHODS OF RESEARCH *

METHOD	PURPOSE	EXAMPLES
HISTORICAL	To reconstruct the past objectively and accurately, often in relation to the tenability of an hypothesis.	A study reconstructing practices in the teaching of spelling in the United States during the past fifty years; tracing the history of civil rights in the United States education since the civil war; testing the hypothesis that Francis Bacon is the real author of the "works of William Shakespeare."
DESCRIPTIVE	To describe systematically a situation or area of interest factually and accurately.	Population census studies, public opinion surveys, fact-finding surveys, status studies, task analysis studies, questionnaire and interview studies, observation studies, job descriptions, surveys of the literature, documentary analyses, anecdotal records, critical incident reports, test score analyses, and normative data.
DEVELOPMENTAL	To investigate patterns and sequences of growth and/or change as a function of time.	A longitudinal growth study following an initial sample of 200 children from six months of age to adulthood; a cross-sectional growth study investigating changing patterns of intelligence by sampling groups of children at ten different age levels; a trend study projecting the future growth and educational needs of a community from past trends and recent building estimates.
CASE AND FIELD	To study intensively the background, current status, and environmental interactions of a given social unit: an individual, group, institution, or community.	The case history of a child with an above average IQ but with severe learning disabilities; an intensive study of a group of teenage youngsters on probation for drug abuse; an intensive study of a typical suburban community in the Midwest in terms of its socio-economic characteristics.
CORRELATIONAL	To investigate the extent to which variations in one factor correspond with variations in one or more other factors based on correlation coefficients.	To investigate relationships between reading achievement scores and one or more other variables of interest; a factor-analytic study of several intelligence tests; a study to predict success in college based on intercorrelation patterns between college grades and selected high school variables.
CAUSAL-COMPARATIVE or "EX POST FACTO"	To investigate possible cause-and-effect relationships by observing some existing consequence and searching back through the data for plausible casual factors.	To identify factors related to the "drop-out" problem in a particular high school using data from records over the past ten years; to investigate similarities and differences between such groups as smokers and nonsmokers, readers and nonreaders, or delinquents and nondelinquents, using data on file.
TRUE EXPERIMENTAL	To investigate possible cause-and-effect relationships by exposing one or more experimental groups to one or more treatment conditions and comparing the results to one or more control groups not receiving the treatment (random assignment being essential).	To investigate the effectiveness of three methods of teaching reading to first grade children using random assignments of children and teachers to groups and methods; to investigate the effects of a specific tranquilizing drug on the learning behavior of boys identified as "hyperactive" using random assignment to groups receiving three different levels of the drug and two control groups with and without a placebo, respectively.
QUASI-EXPERIMENTAL	To approximate the conditions of the true experiment in a setting which does not allow the control and/or manipulation of all relevant variables. The researcher must clearly understand what compromises exist in the internal and external validity of his design and proceed within these limitations.	Most so-called field experiments, operational research, and even the more sophisticated forms of action research which attempt to get at causal factors in real life settings where only partial control is possible; e.g., an investigation of the effectiveness of any method or treatment condition where random assignment of subjects to methods or conditions is not possible.
ACTION	To develop new skills or new approaches and to solve problems with direct application to the classroom or other applied setting.	An inservice training program to help teachers develop new skills in facilitating class discussions; to experiment with new approaches to teaching reading to bilingual children; to develop more effective counseling techniques for underachievers.

* Isaac, S., & Michael, W. B. Handbook in research and evaluation. San Diego: Robert R. Knapp, 1971. Pp. 14-15. (Reproduced by permission.)

13, 14

SECTION IV

Abstracting Guidelines

These guidelines are a modification of those developed by Payne, Munger, and Altman (1962). Portions of the guidelines set in quotes come directly from that document. The format employed here is based upon their format and a number of steps have been paraphrased from their materials.

General Instructions for Abstractors

1. Using the APA Publication Manual, enter an accurate bibliographic reference on the second page of the Abstract Form and then read through the article to be abstracted in its entirety. Before you begin abstracting, be certain that you fully understand the contents of the document. If the article appears too difficult for you, do not attempt to abstract it.

   If the article calls for a Type I abstract, look for innovative techniques that would help an instructional system designer. If the article calls for a Type II abstract, pay particular attention to the methodology, results, and discussion/conclusions sections.

2. Complete all four sections of the Summary and Evaluation Form (Page 3 of the Abstract Form) during or after reading the document but before writing the abstract.

3. Use short, complete sentences. Make sure your meaning is absolutely clear. Avoid the use of compound sentences when possible. For ease of reading by typical users, you should insure that your materials receive an average fog count of about 20 (Department of the Air Force, 1969).

4. Present data and techniques accurately. In Type II abstracts present results and other data accurately, without distortion. Likewise, when citing particular techniques in Type I abstracts, be sure the summarization is appropriate. Abstracted data and techniques must be double checked against the original article to insure accuracy.

5. Both Type I and Type II abstracts may be of any length necessary to adequately cover a document, but they should be as concise as possible. In the interests of brevity, do not present material which is (a) common knowledge to practitioners in the field, or (b) redundant to other material included in the abstract.

6. Define any technical words or phrases which are new to you and/or not currently listed in the Directory of General Search Terms

(Appendix IV). These may be listed on a separate sheet of paper and attached to the abstract, unless their definition is required for understanding the abstract.

7. Use only abbreviations and symbols that are known to be standard.

8. For documents requiring Type II abstracts that consist of a series of experiments which are related and interdependent (such as a research monograph) more than one abstract may be needed. "A summary abstract should be prepared which covers the basic findings and conclusions of the series." If detailed descriptions of methodology, results, and discussion/conclusions are not possible in the summary abstract, prepare separate abstracts for the individual experiments.

9. A document is evaluated with the help of the checklist (on the Summary and Evaluation Form) that was completed prior to writing the abstract.

10. While reading the document, note the location in the document of all suggestions for additional research. After you have completed the abstract, synthesize these suggestions for additional research and list them in the appropriate place on the first page of the Abstract Form.

11. While reading the document, make notes of all General and Unique Search Terms. After you have completed the abstract, check again for additional search terms. Then alphabetically list all pertinent terms in their respective sections on the first page of the Abstract Form.

Detailed Abstracting Guidelines: Step-By-Step Procedures

The instructions are composed of ten separate steps. For certain types of articles some of the steps are bypassed as noted in all capital letters. These instructions should be followed explicitly.

STEP 1. Prepare a standard bibliographic reference on Page 2 of the abstract blank. Use the form and order recommended by the APA Publication Manual attached as Appendix III. Abstractors should become completely familiar with the APA style for citing bibliographic information, including such details as punctuation, underlining, etc. A major exception is that items normally underlined in the reference are placed in quotation marks for ease of computer search. The general order and form are presented below:

A. Author(s)	"Give names of all authors. Use inverted order, the surname first, followed by the initial or initials."
B. Title	Use the full title, capitalizing only the first word of the title, unless there is

a colon, in which case the word following the colon is also capitalized. Titles of articles, monographs, and most reports are not underlined or placed in quotes. Titles of books are placed in quotes.

C. Publication Information

Book — Cite city (and state, if the city is obscure or there are several cities of the same name) of publication followed by a colon, publisher's name, and year of publication. Cite page numbers if document to be abstracted is a section of the book.

Periodical — Cite full periodical name and place it in quotes. Cite year of publication. Cite volume number and place it in quotes. Cite issue number and place it in parentheses. Cite inclusive page numbers of article to be abstracted.

Government Report — "No simple rules can be given. Give sufficient information so that identification is possible." For example, report document numbers, contractors' names, and publication dates.

NOTE: Specify the nature of the publication (book, periodical, government report), if it is not obvious from the previous reference information.

D. Library Acquisition Numbers — For a document that is catalogued in a major information center (e.g., ERIC or DDC) provide the acquisition number in parentheses at the end of the reference.

STEP 2. Complete the Summary and Evaluation Form on Page 3 of the Abstract Form. You should fill out Part 1, Evaluative Checklists, as you read the document. Parts 2, 3, and 4 may be filled out during or after reading the article but before preparing the body of the abstract.

A. Evaluative Checklists — Choose the correct evaluative checklist (Type I or Type II) and fill it out according to the attached instructions while you are reading the document. For items which are not fully satisfied by the document, be sure to make a note of the defect on a separate sheet of paper. For convenience in the preparation

of the evaluation, number your notes to correspond with the items. Only one checklist is filled out for each document.

B. Document X Topic Profile

Do not check cells if an ISD topic is simply mentioned in a document. Check a cell only if the associated topic is discussed substantially or is a focus of the document. A document may pertain significantly to one, several, or all topics. Check all relevant categories (cells). Also, a document may be of more than one type (e.g., both an evaluative summary and an annotated bibliography) in which case all the associated cells should be checked. With the added insight gained from preparing the abstract, additions or deletions may be made.

C. Media and Instructional Methods Discussed in Article

Black in the boxes for media and instructional methods that are treated substantially in a Type I document. For Type II abstracts, indicate media/methods that are important parts of statistical sampling studies, correlational research, or research studies that manipulate variables whether or not they are discussed at length. With the added insight gained from preparing the abstract, additions or deletions may be made.

(FOR TYPE I ABSTRACTS, GO TO STEP 3)

D. Types and Methods of Research (TYPE II ABSTRACTS ONLY)

For Type II abstracts, indicate the appropriate types and methods of research that were used by the author(s). It is recommended that the initial indication be made while reading the document, then, after writing the abstract, any additional items that were missed the first time should be marked. Methods of research are described in Table 1, Page 12.

(FOR TYPE II ABSTRACTS, SKIP TO STEP 4)

STEP 3. (TYPE I ABSTRACTS ONLY. TYPE II ABSTRACTS: GO TO STEP 4)

This section comprises the body of the Type I abstract. The contents of the document are summarized in this section.

A. Summarize Contents

"Indicate the subject matter as clearly and concisely as possible." This section should be like a concisely annotated table of contents. For example, if the author includes headings and subheadings, list these with a brief description of what is included under each heading or subheading.

B. Innovations and Conclusions — Describe any innovative applications or concepts which might be useful for ISD. If the author draws any substantive conclusions applicable to ISD, describe these.

(GO TO STEP 7)

STEP 4. (THIS STEP AND STEPS 5 & 6 ARE APPLICABLE TO TYPE II ABSTRACTS ONLY)

"State the problem and describe its utility as accurately and concisely as possible." Information included in this section must be adequate for understanding the discussion/conclusions section.

A. General Statement of Problem — "Problem statement should be brief. If the author has offered an hypothesis, this should be explicitly stated and identified as such. If the author has not presented an hypothesis, derive an hypothesis-like statement indicating origin by the abstractor. In either case, this statement must present information which defines what the article investigates."

B. Applicability of the Study — Give the specific applicability of the study and the reasons for the investigation. What is the import of the work; how does the author justify the research?

STEP 5. (APPLICABLE TO TYPE II ABSTRACTS ONLY)

Describe the method of investigation so that the results can be evaluated adequately. "Study conditions must be presented in a logical manner, so that there is consistent progression and no redundancy. The following indications of study conditions should be included."

A. Subjects

(1) Describe characteristics of population including size, location, age or grade level, and other specific characteristics.

(2) Identify sampling procedures.

(3) Describe characteristics of sample as in A(1) above.

NOTE: A(1) through A(3) may be stated briefly, for example: "The Ss were 220 introductory psychology students at Midwestern University, who served in partial fulfillment of a course requirement; Ss were naive with respect to the experimental material."

B. Experimental Design, Variables, & Statistical Treatment	(1)	"Specify the investigative method(s) used in approaching the problem. Describe or outline the research design. Traditional, orthodox designs can be referred to in common terms and need only a brief description. New or unique designs should be clearly described in terms of their essential features."
	(2)	Identify the independent and dependent variables quantitatively and/or qualitatively.
	(3)	If measures were taken, indicate the units of measurement used and method of data analysis. Traditional, orthodox methods of data analysis can be referred to in common terms and need only a brief description. Indicate how the research design in B(2) above calls for the particular type of data analysis that is used. Specify statistical controls that were imposed on the investigation, e.g., counterbalancing, covariates, etc.
C. Apparatus and Materials	(1)	Give descriptions and specifications of equipment and apparatus if relevant to the study conditions. Likewise, describe all teaching methods, aids, media, and instructional devices employed.
	(2)	"Indicate what was examined." Indicate subject matter or performance taught as appropriate.
D. Procedure and Procedural Controls	(1)	Present sufficient detail so that the procedural approach can be fully understood. However, do not present all the detail necessary for replicating the research. If the user of the technical data file needed to replicate an investigation, he would have to consult the original document anyway.
	(2)	Indicate what procedural controls were imposed on the investigation. For example, were special instructions given Ss in order to control for motivational effects; were instructions presented by tape recorder to help prevent experimenter bias, etc.

E. Unusual Sources of Data

(1) Transformed data--"When data have been manipulated in any way prior to data analysis, present sufficient information to enable the user to follow the manipulation. Standard data handling techniques need not be described in the same detail as variations or novel techniques."

(2) Non-original data--If not obvious from the preceding parts of the abstract, indicate whether the author reported data generated by himself or by others.

NOTE: The material covered in Step 5 above is reviewed in greater specificity in items 10 through 29 on the Evaluation Checklist for Type II Abstracts. (See the Summary and Evaluation Form.)

STEP 6. (APPLICABLE TO TYPE II ABSTRACTS ONLY)

Present the major results and identify the conclusions associated with them.

A. Results and Direct Conclusions

Results should be presented in such detail that conclusions are obvious. State direct conclusions. Direct conclusions must relate only to parameters of the investigation previously specified. Conclusions presented must be preceded by sufficient data to justify the conclusions.

When results are essentially answers to specific problems, present data in sufficient detail to justify the problem solution. Indicate level of significance.

Place brackets around the sentence or sentences relating to direct conclusions which indicate the relationship between the independent and dependent variables. These statements will be typed in all caps with asterisks (**) surrounding them.

B. Indirect Conclusions

"State indirect conclusions. Indirect conclusions may relate to secondary or peripheral areas of investigation, inferences, and interpretations made by the author. Present the data which led to these conclusions, inferences, and interpretations." Loose theoretical linkages and speculative questions should be excluded.

STEP 7. Evaluate the document in the space provided on Page 2 of the Abstract Form.

A. Evaluation Checklists

As noted in Step 2A, the evaluation checklists (either for Type I or Type II abstracts)

should be filled out while the article is being read. Notes of defects, keyed to the 25 items (54 items for Type II) have already been made. All that remains is to summarize the defects in the evaluation section of the Abstract Form, using complete sentences.

B. Summary Statement

In addition to commenting on the defects in the document, you should write a brief summary statement to complete the evaluation. The summary should indicate the overall quality and importance for ISD of the document. For example, if an article fully satisfied almost all of the applicable checklist items (i.e., almost all items were rated 1), the abstractor would make a special note of the high quality of that article.

STEP 8. Identify the suggestions for additional research put forth in the document. The recommended procedure is to note where the author makes suggestions for additional research in the text of the document. Then an overall assessment of these suggestions should be made. Loose theoretical linkages and purely speculative questions should be excluded. The remaining suggestions for additional research should be synthesized and listed in the appropriate space on Page 1 of the Abstract Profile. The statements should be explicit enough that the nature of the suggestions can be understood independent of the abstract. After each suggestion, note in parentheses the document sequence number and year of document publication.

STEP 9. List General and Unique Search Terms alphabetically in the appropriate spaces on Page 1 of the Abstract Form.

A. General Search Terms

General Search Terms are derived from the following sources: (1) a keyword list attached to the document, (2) the title and major paragraph or section headings, (3) the ISD activities or topics discussed, (4) types of media and media characteristics, (5) other types of instructional aids, and (6) experimental variables.

A directory of the most frequently used general terms has been compiled and is attached to this handbook as Appendix IV. The terms you list on the Abstract Form should be among those listed in the Directory to insure standardization. Consequently, you must become familiar with the Directory and not list a new term unless absolutely necessary (i.e., the term in question is clearly not a Unique Search Term). If you find a legitimate General Search Term not

listed in the Directory, you would attach a definition of the new term to the abstract as noted in item 5 of the General Instructions for Abstractors. Also note that some of the general terms in Appendix IV are preceded by an asterisk. These may be subject to misinterpretation and are defined in the Glossary attached as Appendix V. Many authors use new terms that can be described satisfactorily with existing ones, so be familiar with the Directory of General Search Terms and the Glossary.

NOTE: If an author uses a term that does not appear in the Directory in the author's form, or as a synonym or cognate, the term should be considered for listing as a Unique Search Term.

B. Unique Search Terms

Unique Search Terms are defined as possible search terms which are not included in the Directory of General Search Terms. They tend to be unique to the particular document. Most frequently they will include: (1) system names, (2) acronyms, (3) trade names, (4) new terms that the author discussed in detail in the text, and (5) the names of other authors whose work has had a clear and present influence on the article being reviewed.

STEP 10. The final step in the preparation of the abstract is self-editing. Check the abstract for quality and style of writing, completeness, and general readability. The APA Publication Manual contains excellent suggestions for improving the quality, style, and readability of technical writing in Sections 2 through 2.33 and 4 through 4.67. Become familiar with these suggestions and follow them whenever possible.

When the self-editing is completed, indicate on Page 2 of the Abstract Form, the number of pages in the document and the number of references cited. Finally, initial the Abstract Form in the appropriate space on Page 2.

APPENDIX I

SAMPLE TYPE I ABSTRACT

SEQUENCE NO. 12
ABSTRACT TYPE: I X II

ABSTRACT FORM

AUTHOR(S): Air Training Command

TITLE: Instructional Systems Engineering

PUBLISHER: Air Training Command, Randolph Air Force Base, Texas

REPORT NUMBER: ATCM 52-10 DATE: March 1967

GENERAL SEARCH TERMS:

Criterion Test
Data Collecting
Design of Instruction
Field Test
Implementation
Instructional Materials Center
Instructor Responsibilities
Instructor Role
Knowledge of Results
Media, Selection of
Pacing
Plan of Instruction
Programmed Instruction
Response Mode
SOLO
Step Size
Systems Approach to Training
Task Analysis
Task Identification
Threshold Knowledge Test
Tryout

UNIQUE SEARCH TERMS:

None

SUGGESTIONS FOR ADDITIONAL RESEARCH:

None

CROSS REFERENCE: (SEQUENCE NUMBERS)

None

BIBLIOGRAPHIC REFERENCE:

Air Training Command. "Instructional systems engineering". Randolph Air Force Base, Texas: Author, March 1967. ATCM 52-10.

BODY OF ABSTRACT:

Chapter 1 discusses the programmed instructional system--its origin and application in training. The emphasis of the article is on the systems approach as a new process which ends in the development of a complete learning environment.

Chapter 2 discusses the programmed instructional system--its characteristics. Behavior, stimulus, and response are defined. Characteristics common to all programmed instructional systems are discussed:

1. analysis of behavior
2. controlled responding
3. knowledge of results
4. optimum step-size
5. planned-pacing
6. validation prior to implementation
7. student centered

Chapter 3 discusses planning curriculum analysis--a series of steps to determine course content and to develop an effective programmed instructional system for a course is outlined.

Chapter 4 describes the general development activities. Reviewed are:

1. Statements of learning objectives--guidelines, including sample statements of good learning objectives.

2. The criterion test--guidelines on how to construct it.

3. The threshold knowledge test--guidelines on its construction and use. (The threshold knowledge test, given to a sample of prospective students before the course, is designed to help determine what to put into the course of instruction.)

4. Selection of media--examples of ineffective media and media considerations.

5. The production phase--editing process outlined.

ABSTRACT, CONT'D.

Chapter 5 discusses the validation process. It is accomplished in student sample tryouts (individual and small groups) conducted by the system designer, and operational tryouts conducted by the course personnel. Guidelines are provided for conducting them.

EVALUATION OF DOCUMENT:

This paper provides an excellent overview of the systems approach to instructional design. It relates the process to some of the important principles of learning. At the level of a general guideline, it succeeds in integrating the practical and theoretical concerns of instructional systems engineering. Some of the terminology employed (e.g., SOLOs--for Statements of Learning Objectives) is no longer commonly used. Many of the topics are treated more comprehensively in other Air Force documents including AFM 50-2. (P=32, R=12, SS)

SUMMARY AND EVALUATION FORM

SEQUENCE NO. 12

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are aids for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

- If an item does not apply in any way, mark the NA box in the space to the left of the item.
- If a document fully satisfies an item criterion, mark the 1 box to the left of the item.
- If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.
- If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

If you rate an item 2 or 3, make a brief note on scratch paper describing the defect.

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

NA	1	2	3	
				Descriptive Summary of Content:
				1. Title of document describes contents.
				2. Headings and subheadings outline contents.
				3. Area of interest is delineated clearly.
				4. Reasons for dealing with this area are clear.
				5. Problem area is covered adequately.
				6. Approach to problem area is appropriate.
				7. Limitations of approach are covered.
				8. Important terms are defined.
				9. Relationship of this document to other relevant literature is stated.
				10. Reviews of research are clear and concise.
				11. Reviews of research specify designs employed.
				12. Graphs and tables are presented clearly.
				13. Conclusions are stated clearly.
				14. Conclusions are substantiated by evidence presented in the document.
				15. Conclusions are confined to the problem area discussed in the document.
				16. Implications for future research are logically formulated.
				17. Bibliography is properly organized and presented clearly.
				Clarity and Usefulness:
				18. Document does not refresh established principles.
				19. Document presents applications relevant to ISD.
				20. Document presents concepts relevant to ISD.
				21. Conclusions are important for ISD.
				22. Style of writing is appropriate for typical ISD users.
				23. Document is written clearly.
				24. Document is reasonably easy to follow and is not confusing.
				25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

NA	1	2	3	
				Introduction:
				1. Title of document adequately describes contents.
				2. Problem is stated clearly.
				3. Reasons for investigating problem are clear.
				4. Assumptions are stated clearly.
				5. Limitations of the study are stated.
				6. Important terms are defined.
				7. Relationship of the problem to previous research is clear.
				8. Previous research is reviewed adequately for author's purposes.
				9. Hypotheses are stated clearly.
				Method:
				10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
				11. Method of sampling is adequately described and is appropriate.
				12. Sample is adequately described as to size, location, age, and other relevant characteristics.
				13. Research design is described fully.
				14. Rationale for specific research design is adequately justified.
				15. Research design is well suited for solution of the problem.
				16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
				17. The effects of independent variables are not confounded with the effects of motivational variables.
				18. Control groups are appropriate for comparison with experimental groups.
				19. Independent variables are adequately specified. (Qualitatively)
				20. Dependent variables are adequately specified. (Qualitatively)
				21. Variables are operationally defined. (Quantitative, generally)
				22. Appropriate measures are selected for dependent variables.
				23. Experimenter manipulates what he says he manipulates.
				24. Conditions under which experiment was conducted are clearly specified and delimited in sufficient detail.
				25. Research design is free of other specific weaknesses.
				26. Data-gathering methods or procedures are described in sufficient detail to allow replication.
				27. Data-gathering methods or procedures follow from the research design.
				28. Data-gathering methods or procedures are appropriate to the solution of the problem.
				29. Data-gathering methods or procedures do not introduce artifactual biases into data.
				30. Researcher has taken appropriate steps to eliminate or control for experimenter bias and self-fulfilling prophecy.
				Results:
				31. Data-gathering methods or procedures are used correctly.
				32. Reliability of measuring instruments is established.
				33. Validity of measuring instruments is established.
				34. Appropriate methods are selected to analyze the data in accordance with those indicated by the research design.
				35. Methods used to analyze the data are used correctly.
				36. Results of the analyses are presented clearly.
				37. Graphs and tables are presented clearly.
				38. Only significant results are introduced as meaningful data.
				39. Confidence levels are stated clearly and, if unusual, justified.
				40. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
				41. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.
				Discussion:
				42. Conclusions are stated clearly.
				43. Conclusions are substantiated by the evidence presented.
				44. Generalizations are confined to the population from which the sample was drawn.
				45. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.
				46. Inferential and interpretive conclusions are clearly identified as such.
				47. Inferential and interpretive conclusions are justified.
				48. Speculations, guesses, and theorizing are not presented as conclusions that follow from the data.
				49. Implications for future research are logically formulated.
				Clarity and Usefulness:
				50. Report is written clearly.
				51. Report is logically organized.
				52. Report is reasonably easy to follow and is not confusing.
				53. Tone of the report displays an unbiased, impartial scientific attitude.
				54. Report is of good overall quality.
				55. Report is of importance to the problem area.

2. DOCUMENT X TOPIC PROFILE

ISD Task No. (AFM 50-2)	Type I Abstract: Definition & Scope	Bibliography	Type II Abstract: Statistical or Computing Study	Correlational Research	Research in Theory (Manipulative Var.)	Other Specify	1 or 11
1 Determine Job (or Activity) Performance Requirements		X					
2 Determine Education or Training Requirements		X					
3 Determine Instructional Objectives		X					
3 Develop Tests		X					
4 Select Media/Methods		X					
4 Develop Instructional Materials		X					
4 Validate and Revise Instructional Materials		X					
5 Conduct Instructional Program							
5 Evaluate Instructional Program							
Other Specify: _____							

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

3A. COMMUNICATION MEDIA

Audio:
- ☐ Radio
- ☐ Tape Recorder
- ☐ Record Player
- ☐ Listening Lab

Visual:
- ☐ Filmstrip (Silent)
- ☐ Motion Picture as Repetitive Loop (Silent)
- ☐ Textbook
- ☐ Microform

Audiovisual:
- ☐ Sound Slide Projector
- ☐ Filmstrip/Sound
- ☐ Television
- ☐ Motion Picture
- ☐ Motion Picture as Repetitive Loop

3B. ENVIRONMENTAL MEDIA/AIDS

- ☐ Simulator
- ☐ Part Task Trainer
- ☐ Whole Task Trainer
- ☐ Procedures Trainer
- ☐ Games
- ☐ Role Play
- ☐ Sociodrama
- ■ Operational Equipment

3C. TUTORIAL MEDIA

- ☐ CAI/CMI
- ■ Programmed Text
- ☐ Teaching Machine
- ☐ Learning Lab

3D. MULTIMEDIA

_____

_____

_____

_____

3E. VISUAL AIDS

Graphics:
- ☐ Charts
- ☐ Diagrams
- ☐ Graphs
- ☐ Illustrations/ Drawings
- ☐ Photographs

Exhibits:
- ☐ Cut-A-Ways
- ☐ Mockups
- ☐ Models

Projected Images:
- ☐ Opaque Projections
- ☐ Overhead Transparencies
- ☐ Slides

3F. METHODS OF INSTRUCTION

- ☐ Tutorial
- ☐ Lecture
- ☐ Recitation
- ☐ Discussion
- ■ Demonstration
- ■ Self-Instruction
- ■ Simulation
- ☐ Peer Training
- ☐ Team Training

3G. OTHER: SPECIFY

Actual Task Practice

_____

_____

_____

_____

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

4A. TYPE OF RESEARCH

- ☐ Basic
- ☐ Lab Study
- ☐ Applied
- ☐ Field Study

4B. METHOD OF RESEARCH

- ☐ Historical
- ☐ Descriptive
- ☐ Case & Field Developmental
- ☐ Causal Comparative or "Ex Post Facto"
- ☐ Correlational
- ☐ True Experimental
- ☐ Quasi-Experimental
- ☐ Action
- ☐ Other, Specify: _____

APPENDIX II

SAMPLE TYPE II ABSTRACT

SEQUENCE NO. 1001
ABSTRACT TYPE: (X) ( )

ABSTRACT FORM

AUTHOR(S): T. S. Baldwin & L. J. Bailey

TITLE: Readability of Technical Training Materials Presented on Microfiche Versus Offset Copy

PUBLISHER: Journal of Applied Psychology

REPORT NUMBER: Vol. 55 DATE: 1971

GENERAL SEARCH TERMS:

Media, Effects of
Media, Evaluation of
Media, Instructional
Media, Preparation
Microform
Reading
Tests, Construction
Tests, Development
Tests, Reliability of
Training Materials

UNIQUE SEARCH TERMS:

Offset Copy
Positive and Negative Microfiche
Readability

SUGGESTIONS FOR ADDITIONAL RESEARCH:

Investigations of methods for increasing the reading efficiency of microfiche materials and equipment should be conducted including assessing the effect of ambient lighting, screen glare and image sharpness. (1001/1971)

Applications of microfiche materials for education and training purposes should be investigated. (1001/1971)

Further research is needed to compare the learning rates of Ss using microfilmed materials with the learning rates of Ss using offset copies of the same materials. (1001/1971)

CROSS REFERENCE: (SEQUENCE NUMBERS)

None

Sequence No. 1001

BIBLIOGRAPHIC REFERENCE:

Baldwin, T. S., & Bailey, L. J. Readability of technical training materials presented on microfiche versus offset copy. "Journal of Applied Psychology", 1971, "55", 37-41.

BODY OF ABSTRACT:

The purposes of this study were to: (a) develop reliable and valid psychometric instruments, representative of Air Force training materials, that can be used for evaluating readability of several types of material presented in various visual media, and (b) conduct an experimental study in which these instruments were used to measure changes in readability as a function of medium of presentation. The authors hypothesized that (a) reader performance using black and white offset copy would be significantly better than performance on either positive or negative microfiche, and that (b) reader performance would not be significantly different for positive versus negative microfiche. The authors cited a review of literature related to research application of microfilm (Field, 1968), noting Field's conclusion that little recent, definitive work on the subject has been published. The present study is important since it investigated the relative readability of microforms compared to offset copy and, hence, pertains to training in which microform materials are used.

Psychometric instruments were developed from Air Force training matter and from other sources with the necessary face validity to represent Air Force material. These instruments consisted of 12 tests, three in each of the following four categories: (a) materials requiring the reading of continuing prose and short paragraphs; (b) material requiring the identification of and discrimination among precise symbols and figures; (c) material using the skills employed in reading charts, tables, graphs, maps, and isometric and orthographic drawings; and (d) material requiring the skills used in reading schematics, block diagrams, wiring diagrams, flow charts, and nomenclature verification. All instruments were primarily speed tests, hence, the reliability of each test was determined by a test-retest procedure. The Spearman-Brown prophecy formula was used to estimate the reliabilities for the total tests' lengths; these reliabilities were acceptable ranging from .76 to .93 for 11 of the tests, but the flow diagram test's reliability (.59) was unacceptable.

Ss were selected from students in Personnel Awaiting Training Status at Chanute Air Force Base, Illinois. Commanders of 13 student squadrons were asked to randomly select eight students per day for testing; these 133 Ss were randomly assigned to one of three groups: 43 in the positive microfiche group, 45 in the negative microfiche group, and 45 in the offset copy group. A between Ss ANOVA of Groups X Armed Forces Qualification Test scores showed no significant differences among groups, which the authors interpreted as indicating no differences in the general intelligence of the groups.

ABSTRACT, CONT'D.

Each of the 12 tests were reproduced as offset copies, negative microfiches, and positive microfiches. Microfiche readers, deemed to be representative of the readers in use throughout the Air Force, were used to present the microfiches. Project personnel administered the tests using standardized test procedures and instructors. Tests were administered in counterbalanced sequences within each group to control for the effect of fatigue.

The independent variable was medium of test presentation (positive or negative microfiche, or offset copy); the dependent variable was correct number of responses on each test. A between Ss ANOVA design was used to assess the effect of medium of presentation of the number of correct responses. A principal axis factor analysis of the intercorrelations among the 12 tests and Varimax rotation of the extracted factors yielded communalities that, when compared with the 12 tests' reliabilities, indicated that a number of the tests had considerable specific variance. Consequently ANOVAs were computed separately for each test.

Results on three of the 12 tests were significantly affected by medium of presentation: Test 7, graphs ($F=3.5$, $df=2/130$, $p<.05$); test 4, figure identification ($F=10.48$, $df=2/130$, $p<.01$); and test 6, symbol translation ($F-11.29$, $df=2/130$, $p<.01$). For each of these three tests, one-tailed t tests were used to test differences between mean scores on offset copy and microfiche (since it was hypothesized that differences would favor offset copy), and a two-tailed t test was used to test differences between mean scores on positive and negative microfiches. Significant differences ($p<.02$) were found for all three tests on the offset copy versus microfiche comparisons.

The authors concluded that **METHOD OF PRESENTATION DOES AFFECT THE READABILITY OF THE MATERIAL ON THE GRAPHS, FIGURE IDENTIFICATION, AND SYMBOL TRANSLATION TESTS AND THAT OFFSET COPY GAVE BETTER READABILITY THAN EITHER NEGATIVE OR POSITIVE MICROFICHES ON THESE THREE TESTS.

The authors noted that further research is needed to determine the influence of such variables as image sharpness, ambient lighting, screen glare, etc., on readability of microfiche presentations. The authors also indicated that research comparing learning rates (instead of correct items on single presentations of tests) as the dependent variable would be desirable to assess further the effects of medium of presentation.

EVALUATION OF DOCUMENT:

The title of this article failed to indicate the test development portion of the study, and the review of and relationship to prior research are poorly handled. The authors failed to describe fully the limitations of this study and the research design and its rationale; for example, the authors gave no reason for using ANOVA instead of analysis of covariance to control for Ss' intelligence. The population and sample were not

EVALUATION OF DOCUMENT, CONT'D.

adequately described and there is some question about the randomness of the S selection procedure. Rate of learning would be a better dependent variable. The authors did not specify the statistics to be applied in their design and seem to have selected them after the data were collected. In addition, motivational variables may have become confounded with the independent variable in that Ss seemed to prefer using microfiche readers.

Non-independent t tests were used to evaluate the significance of groups' mean scores after ANOVAs were computed. The authors stated that they accepted the null hypothesis for nine out of the twelve tests used as the dependent variable, and nonsignificant results were listed.

The authors did state their conclusions in a clear manner and stuck to the data in formulating them. The report is clearly written and logically organized, yet is still confusing.

This article is only of fair quality overall, due largely to deficiencies in the research design and statistical analyses. However, it bears relevance to ISD, specifically to the selection of media and the preparation of training materials. Since microforms are becoming increasingly widely used in training applications, research such as that reported in this article is important. (P=5, R=2, RBP)

SUMMARY AND EVALUATION FORM

SEQUENCE NO. 1001

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are aids for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

- If an item does not apply in any way, mark the NA box in the space to the left of the item.
- If a document fully satisfies an item criterion, mark the 1 box to the left of the item.
- If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.
- If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

(If you rate an item 2 or 3, make a brief note on scratch paper describing the deficit.)

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

Descriptive Summary of Content:

1. Title of document describes contents.
2. Headings and subheadings outline contents.
3. Area of interest is delineated clearly.
4. Reasons for dealing with this area are clear.
5. Problem area is covered adequately.
6. Approach to problem area is appropriate.
7. Limitations of approach are covered.
8. Important terms are defined.
9. Relationship of this document to other relevant literature is stated.
10. Reviews of research are clear and concise.
11. Reviews of research specify designs employed.
12. Graphs and tables are presented clearly.
13. Conclusions are stated clearly.
14. Conclusions are substantiated by evidence presented in the document.
15. Conclusions are confined to the problem area discussed in the document.
16. Implications for future research are logically formulated.
17. Bibliography is properly organized and presented clearly.

Clarity and Usefulness:

18. Document does not refresh established principles.
19. Document presents applications relevant to ISD.
20. Document presents concepts relevant to ISD.
21. Conclusions are important for ISD.
22. Style of writing is appropriate for typical ISD users.
23. Document is written clearly.
24. Document is reasonably easy to follow and is not confusing.
25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

Introduction:

1. Title of document adequately describes contents.
2. Problem is stated clearly.
3. Reasons for investigating problem are clear.
4. Assumptions are stated clearly.
5. Limitations of the study are stated.
6. Important terms are defined.
7. Relationship of the problem to previous research is clear.
8. Previous research is reviewed adequately for author's purposes.
9. Hypotheses are stated clearly.

Method:

10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
11. Method of sampling is adequately described and appropriate.
12. Sample is adequately described as to size, location, age, and other relevant characteristics.
13. Research design is described fully.
14. Rationale for specific research design is adequately justified.
15. Research design is best suited for solution of the problem.
16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
17. The effects of independent variables are not confounded with the effects of mediational variables.
18. Control groups are appropriate for comparison with experimental groups.
19. Independent variables are adequately specified. (Quantitative)
20. Dependent variables are adequately specified. (Quantitative)
21. Variables are operationally defined. (Quantitative, generally)
22. Appropriate measures are selected for dependent variables.
23. Experimenter manipulates what he says he manipulates.
24. Conditions under which experiment was conducted are clearly specified and delineated in sufficient detail.
25. Research design is free of other specific weaknesses.
26. Data-gathering methods or procedures are described in sufficient detail to allow replication.
27. Data-gathering methods or procedures follow from the research design; methods or procedures are appropriate to the solution of the problem.
28. Data-gathering methods or procedures do not introduce artifactual biases into data.
29. Researcher has taken appropriate steps to eliminate or control for experimenter bias and self-fulfilling prophecy.

Results:

30. Data-gathering methods or procedures are used correctly.
31. Reliability of measuring instruments is established.
32. Validity of measuring instruments is established.
33. Appropriate methods are selected to analyze the data in accordance with those included by the research design.
34. Methods used to analyze the data are used correctly.
35. Results of the analyses are presented clearly.
36. Graphs and tables are presented clearly.
37. Only significant results are introduced as meaningful data.
38. Confidence levels are stated clearly and if unusual, justified.
39. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
40. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.

Discussion:

41. Conclusions are stated clearly.
42. Conclusions are substantiated by the evidence presented.
43. Generalizations are confined to the population from which the sample was drawn.
44. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.
45. Inferential and interpretive conclusions are clearly specified as such.
46. Inferential and interpretive conclusions are justified.
47. Speculations, pursuits, and theorizing are not presented as conclusions that follow from the data.
48. Implications for future research are logically formulated.

Clarity and Usefulness:

49. Report is written clearly.
50. Report is logically organized.
51. Report is reasonably easy to follow and is not confusing.
52. Tone of the report displays an unbiased, impartial scientific attitude.
53. Report is of good overall quality.
54. Report is of importance to the problem area.

2. DOCUMENT X TOPIC PROFILE

ISD Topic No. (AFM 50-2)		Type I Abstract: Decision Article	Methodological Considerations	Evaluative Summary	Literature Review	Bibliography	Type II Abstract: Historical Revisiting Study	Correlational Research	Research Study (Manipulative Var.)	Other Specify	I or II
1	Determine Job (or Activity) Performance Requirements										
2	Determine Education or Training Requirements										
3	Determine Instructional Objectives										
3	Develop Tests										
4	Select Media/Methods								X		
4	Develop Instructional Materials								X		
4	Validate and Revise Instructional Materials										
5	Conduct Instructional Program										
5	Evaluate Instructional Program										
	Other Specify: _____										

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

3A. COMMUNICATION MEDIA

Audio:
- ☐ Radio
- ☐ Tape Recorder
- ☐ Record Player
- ☐ Listening Lab

Visual:
- ☐ Filmstrip (Silent)
- ☐ Motion Picture as Repetitive Loop (Silent)
- ☐ Tele-Board
- ■ Microform

Audiovisual:
- ☐ Sound/Slide Projector
- ☐ Filmstrip/Sound
- ☐ Television
- ☐ Motion Picture
- ☐ Motion Picture as Repetitive Loop

3E. VISUAL AIDS

Graphics:
- ☐ Charts
- ☐ Diagrams
- ☐ Graphs
- ☐ Illustrations/ Drawings
- ☐ Photographs

Exhibits:
- ☐ Cut-'n-Mixes
- ☐ Mockups
- ☐ Models

Projected Images:
- ☐ Opaque
- ☐ Projections
- ☐ Overhead
- ☐ Transparencies
- ☐ Slides

3B. ENVIRONMENTAL MEDIA/AIDS

- ☐ Simulator
- ☐ Part-Task Trainer
- ☐ Whole-Task Trainer
- ☐ Procedures Trainer
- ☐ Games
- ☐ Role Play
- ☐ Sensitivity
- ☐ Operational Equipment

3F. METHODS OF INSTRUCTION

- ☐ Tutorial
- ☐ Lecture
- ☐ Discussion
- ☐ Demonstration
- ☐ Simulation
- ☐ Peer Training
- ☐ Team Training

3C. TUTORIAL MEDIA

- ☐ CAI/CMI
- ☐ Programmed Text
- ☐ Teaching Machine
- ☐ Learning Lab

3G. OTHER: SPECIFY

Offset Copies
Microfiche Readers

3D. MULTIMEDIA

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

4A. TYPE OF RESEARCH

- ☐ Basic
- ■ Lab Study
- ■ Applied
- ☐ Field Study

4B. METHOD OF RESEARCH

- ☐ Historical
- ☐ Descriptive
- ☐ Case & Field
- ☐ Developmental
- ☐ Causal Comparative or "Ex Post Facto"
- ☐ Correlational
- ■ True Experimental
- ☐ Quasi-Experimental
- ■ Action
- ☐ Other, Specify: _____

APPENDIX III

APA PUBLICATION MANUAL EXCERPT*

*Copyright (1967) by the American Psychological Association and reproduced by permission.

8.1 *General Rules*

8.11 *Accuracy of citation.* Accuracy and completeness of citations is of major importance. The purpose of listing the references is to make possible their use by the reader; this purpose cannot be accomplished if the reference data are incorrect or incomplete. The list of references should be carefully checked against the original publications. If original sources are unavailable, but the reference is important enough to be included, the secondary source from which it was secured should also be indicated. Special attention should be given to spelling of proper names, spelling of words in foreign languages (including accents or other special marks), correct journal titles, years, volume numbers, and pages.

8.12 *Capitalization.* Only the initial letter of the first word of the title of a book or article is capitalized, with the following major exceptions: (*a*) The first word of a secondary title following a colon is capitalized (e.g., Studies in perception: A new method); (*b*) proper names, German nouns, etc., are capitalized; (*c*) the first word of a title within a title (e.g., Report on "Cognitive versus inhibitory learning").

8.13 *Punctuation.* Special attention should be given to accuracy and uniformity of punctuation. Titles are not enclosed in quotation marks.

8.14 *Italics.* Only book and journal titles should be underlined to indicate italics.

8.2 *Arrangement of References*

8.21 *Heading.* The list of books and articles cited should be labeled *References,* or, if only one book or article is cited, *Reference.*

8.22 *Authors' names.* Arrange entries in alphabetical order by author's surname, or for multiple authors by the name of the senior (first-named) author. (*a*) Names are given in inverted order — followed by the initial or initials only for both male and female authors (e.g., Clarke, P., *not* Clarke, Peter). For married women, use the surname as given in the publication cited. In typing, each initial is followed by a period *and a space.* Failure to space between initials is a common error. (*b*) In the case of multiple authorship, the inverted order is used for all names, with each

name separated from the preceding name with a comma. The final name is preceded by a comma and an ampersand (&). (*c*) References to an author alone stand first, followed by those of which he is the senior author. References with one senior and different second or third authors are arranged alphabetically by the surname of the second author, etc. (*d*) Several references to the same author or authors are arranged by year of publication, the earlier first. References of the same year are arranged alphabetically by title (excluding "a" or "the"), and lower-case letters in parentheses — for example, (a), (b), etc., — are placed after the final period of each such entry. Note that the author's name is repeated in each entry in the following examples; *do not* replace the name by a dash.

Jones, C. L. Proprioceptive stimuli. *Journal of Experimental Psychology*, 1957, **54**, 27-30.

Jones, C. L. Perception of space. *Journal of Experimental Psychology*, 1958, **56**, 3-17. (a)

Jones, C. L. Space factors. *Journal of Applied Psychology*, 1958, **42**, 91-102. (b)

8.23 *Entries with no personal author.* Entries for which no person is indicated as author may be divided into three classes: (*a*) corporate author indicated, (*b*) article signed "Anonymous," and (*c*) neither of the preceding.

a. When a corporate author is clearly indicated, the accepted practice follows. Examples will be found in the list of references at the end of this manual, specifically American Standards Association (1959).

i. A corporate author may be an association, a government agency, a business firm, etc.

ii. The full official title of the corporate body should be used; for example, American Psychological Association, Psychological Corporation, United States Department of Defense.

iii. A subdivision of a larger unit is entered with the larger body first and the subdivision following; for example, American Psychological Association, Policy and Planning Board; University of Michigan, Department of Psychology.

iv. Corporate authors are arranged in proper alphabetical position with personal authors.

b. Articles signed "Anonymous" are arranged with this word as name entry in the alphabetical list.

c. Entries for which no author is evident should be arranged by title (disregarding the articles "the," "a," "an") in the alphabetical list. Ex-

amples will be found in the list of references of this manual, specifically Webster's (1964).

8.24 *Rules for alphabetization.* The following rules govern special cases of alphabetization: (*a*) Prefixes M', Mc, and Mac should be alphabetized as they actually appear; that is to say, Mc should appear in its logical order in the list and not as though spelled Mac. Abbreviations such as St. and Ste. should also be alphabetized as they appear, and not as though spelled out. (*b*) Compound names are alphabetized under the first part of the name: for example, Kloos-Knies, P.; Lewis-Jones, H. (*c*) Article and preposition prefixes (de, la, du, von, van der, della, etc.) govern alphabetical position according to different rules for different languages. Inasmuch as the prefix when included in Anglicized usage is commonly spoken as part of the surname, the APA journals alphabetize according to the prefix. In certain names—for example, (von) Helmholtz—the prefix is not customarily used in English and the alphabetization then disregards it. (*d*) Certain languages have roman letters not in the English alphabet — Danish æ, ø, and aa; Norwegian æ, ø, or ö, and å or aa; Swedish å, ä, and ö; and Spanish ch, ll, rr, and ñ. Strict rules would require proper alphabetization according to their language, but practical considerations have dictated that APA journals alphabetize them as though they were accented variations of roman letters. This practice is analogous to usage for transliterations from nonroman alphabets.

8.3 *Forms of Book Entries*

Most of the needed instructions can be obtained from the examples which follow. Books that are published annually, such as the *Annual Review of Psychology*, are considered periodicals (see Section 8.4). A few special directions are:

a. Place of publication. Give only the city if the name is distinctive and well known. Give the city and state (or city and country) if there are several cities of that name (e.g., Springfield, Ill.) or if the city is obscure.

b. Publisher's name. Give in as brief a form as will be fully intelligible; for example, McGraw-Hill, not McGraw-Hill Book Co. (but Ronald Press).

c. Citing pages. Particular pages of a book are never cited in the reference list. Specific page references to identify a quotation are given in the text (see Section 8.6).

8.31 *Book.* Cite author, title, city, publisher, and year, in that order.

Jefferds, C. V., Jr. *The psychology of industrial unrest.* New York: McGraw-Hill, 1960.

New edition. Note that edition is abbreviated (ed.).

Jefferds, C. V., Jr. *The psychology of industrial unrest.* (2nd ed.) New York: McGraw-Hill, 1964.

Clarke, P. V. *Psychological study of the Navajos.* (Rev. ed.) Berkeley: University of California Press, 1966.

8.32 *Edited book and specific chapter.* Note that "Editor" is abbreviated (Ed.).

Kelly, J. T. (Ed.) *Theories of psychopathology.* Springfield, Ill.: Charles C Thomas, 1965.

Wood, A. The reinforcement of anxiety. In J. T. Kelly (Ed.), *Theories of psychopathology.* Springfield, Ill.: Charles C Thomas, 1965.

8.33 *Work of several volumes.*

Lochren, H. R. *Collected works.* London: Oxford University Press, 1938-40. 4 vols.

8.34 *One volume of multivolume work.*

Coleberg, E., Matthews, S. T., & Cooper, S. I. *Approaches to educational psychology.* Vol. 1. *Basic principles.* Boston: Houghton Mifflin, 1963.

8.35 *Author as publisher.* If an author is also the publisher, use "Author" for the identification of the publisher.

Branam, F. P. *A new theory of taste.* Chicago: Author, 1960.

Program Development Corporation. *Program for supervisory training.* Smithfield, Ohio: Author, 1964.

8.36 *Author's name in title and collected writings.*

Neckerman, S. F. *Collected papers of . . .* New York: Roidan Press, 1965.

Harris, N. C. (Collected writings) In V. H. Cook (Ed.), *Educational psychology: Contributions of N. C. Harris to the field.* New York: Ronald Press, 1950.

8.4 *Forms of Periodical Entries*

The bold-faced arabic figures used in the illustrations refer to volume numbers.

8.41a *Journal titles.* Titles of journals in the reference list and in text in APA publications are spelled out in full.

8.41b *Journal article, pagination by volume.*

Archer, P. W. The tactile perception of roughness. *American Journal of Psychology*, 1950, **63**, 365-373.

8.41c *Journal article, pagination by issue.* Use issue number (in parentheses following the volume number) only when the journal has independent pagination for each issue.

Cardinal, M. H. Anxiety among displaced children. *Bulletin of the World Federation for Mental Health*, 1950, **2**(4), 27-35.

8.42a *Monograph with volume number, issue number, and serial (whole) number.*

Follette, J. Relation of intelligence to motor skill. *Psychological Monographs*, 1950, **62**(14, Whole No. 287).

8.42b *Monograph without volume number.*

Merewede, D. R. Measurement of teachers' attitudes. *Teachers College Contributions to Education*, 1960, No. 643.

8.42c *Monograph supplement.*

Graham, J. G. Effects of environment on reaction time. *Journal of Experimental Psychology*, 1968, **76**(4, Pt. 2).

8.42d *Annual Periodicals.*

Polis, R.F. Leadership style, hierarchical influence and theoretical implications. *Proceedings of the 74th Annual Convention of the American Psychological Association*, 1966, **1**, 39-40. (Summary)

8.43 *Abstract.*

Newell, N. B. Vocabulary as a function of adult age. *American Psychologist*, 1951, **6**, 420. (Abstract)

8.44 *Secondary source.* While references should, whenever possible, be checked with the original, in a few cases pertinent material is available only from a secondary source. Inclusion of such references is permissible with the secondary source indicated.

Harkavy-Katz, S. Hayelod hahole b'shituk mohi v'hayeled hamongloidi b'hayey hemisphaha. *Harefuah*, 1952, **43**, 70-71. (*Psychological Abstracts*, 1953, **28**, No. 1182)

Smithers, E. F. Mating Behavior. *Midland Annals of Natural History*, 1892, **6**, 4-8. Cited by A. N. Gora, *Amphibian biology*. London: Baker & Smith, 1949. P. 63.

8.45 *Book Reviews.*

Gandt, W. P. Review of J. T. Singer, *Selected works.* (2nd ed.) *Contemporary Psychology,* 1957, **2**, 272-273.

8.46 *Government reports.* The bibliography of reports from governmental agencies, especially the near-print reports of research projects, is exceedingly complex. No single rules for citation can be formulated. *Psychological Abstracts* has used bibliographic entries of the book or journal article form with the addition of identifying data such as Project Number, Contract Number, or the name of the contractor. The basic principle is to give sufficient information so that the interested reader may secure a copy from a library or the issuing agency. A practical suggestion to authors is to cite such reports as they have been cited in *Psychological Abstracts.*

8.47 *Report submitted to an agency.*

Smith, A., & Rauch, J. *Effects of environment on intelligence.* (USPHS Tech. Rep. No. 175) Washington, D.C.: United States Government Printing Office, 1967.

8.48 *Republication.* Cite the reference you actually used; then, in parentheses following the final period, place the words "Originally published," a colon, and only that portion of the information which is novel.

Jones, E. A. *The ego.* New York: Harcourt, Brace & World, 1965. (Originally published: Leipzig: Verlag Press, 1958.)

8.5 *Unpublished Materials*

8.51 *Dissertations.* Authors should make every effort to secure University Microfilm numbers for doctoral dissertations. If unavailable on microfilm, the second form may be used:

Williams, S. R. *The measurement of nystagmus in normals and schizophrenics.* (Doctoral dissertation, University of Vermont) Ann Arbor, Mich.: University Microfilms, 1959, No. 59-297.

Lightburn, L. T. The relation of critical fusion frequency to age. Unpublished doctoral dissertation, University of New Jersey, 1951.

8.52 *Papers presented at scientific meetings.*

Strebor, K. Sociopsychological study of motivation. Paper presented at the meeting of the New England Psychological Association, Boston, April 1966.

8.53 *Symposium.*

Farnum, D. F. (Chm.) Motivation. Symposium presented at the meeting of the American Psychological Association, Philadelphia, August 1963.

8.54 *Contribution to symposium.*

Seis, C. E. Behavior and awareness. In V. A. Berg (Chm.), Research and interpretation. Symposium presented at the meeting of the American Psychological Association, Chicago, September 1965.

8.55 *Material "in press."* An article or book accepted for publication but not yet in print may be designated as "in press." In the reference list it follows all other references by the same author. Provide all information possible at time of writing. Often the reference can be completed by the time the author receives proof. A paper that has merely been submitted but not accepted by a journal should be footnoted.

Sedlack, J. A. Rorschach indicators of anxiety. *Journal of Consulting Psychology*, 1967, **72**, in press.

Marks, G. *Academic and nonacademic accomplishment.* Boston: Little, Brown, 1965, in press.

8.56 *Other unpublished manuscripts.* These works should not be cited unless the manuscript is on file with the NAPS or available from a library. Give author, title, the words "Unpublished manuscript," the library where it is available, or NAPS document number, and the date.

Jones, K. M. Measurement of teachers' attitudes. Unpublished manuscript, Columbia University, 1964.

8.57 *Personal communications.* All references to these communications should be in the text only (J. Barnes, personal communication, July 18, 1970).

APPENDIX IV

DIRECTORY OF GENERAL SEARCH TERMS

Directory of General Search Terms

Ability

*Accelerated Speech

Achievement

*Achievement Test (See also Tests; Measurement)

Acquisition (See also Test)

Acquisition Curves

Active Participation (See Participation of Learner)

*Adaptive Techniques

*Adjunct Programming

Administration (See Management)

*Advance Organizer

Age

Aid

Aid, Job Performance (See *Job Performance Aid)

*Aids, Instructional

Analysis
- Data (See Data Analysis)
- Learning (See Learning Analysis)
- Mode (See *Mode Analysis)
- Systems (See Systems Analysis)
- Task (See *Task Analysis)
- Test

Animated Panel

Animation
- Techniques

Anxiety

Application (See Implementation)

Approach Training

Aptitude
- Patterns
- Scholastic

*Aptitude Test

Assessment Technique (See *Evaluation)

*Association (See also Paired-Associate)

Attention

Attitude

Attitude Restructuring

Audience Aspirations

*Audio Materials

Audio Tape

*Audio-Visual Media

Auditory Training Aids

Aural Learning (See Listening)

Auto-Instruction
- *Device
- *Program [See also Programmed Instruction (PI)]

Autonomy

*Baseline Data (See also *Entering Behavior)

Behavior Modification

Behavior Theory

Behavioral Analysis

*Behavioral Objective (See also *Criterion Objective; *Teaching Step)

Bibliography

Bibliography Included

Black and White

Blackout Ratio (See Detail, Amount of)

*Branch (See also *By-Passing)

Branching Programming (See *Intrinsic Programming)

---

*Term defined in glossary.

*By-Passing (See also *Branch)

CAI [See *Computer-Assisted Instruction (CAI)]

Case Study

Charts (See Graphics)

*Chaining
  Conversational
  Retrogressive

Chalkboard (See also Media)

CMI [See *Computer-Managed Instruction (CMI)]

Cognition

Color

Commentary Variations

Communication

Communication Channels

Communication Modes

Comprehension
  Span of

Compressed Speech (See *Accelerated Speech)

Computer

*Computer-Assisted Instruction (CAI) [See also *Computer-Managed Instruction (CMI)]

Computer Language

*Computer-Managed Instruction (CMI) [See also *Computer-Assisted Instruction (CAI)]

Computer Program (See *Software)

Computer Programmer (See *Programmer, Computer)

*Concept
  Learning

Conditioning, Classical

Conditioning, Instrumental

*Confirmation (See also *Knowledge of Results; *Feedback)

*Constructed Response

Content

Contingencies

Contingency Management (See Behavior Modification)

Controls

Conventional Methods

*Cost-Effectiveness

Course Evaluation (See Evaluation, Course)

Course of Instruction

Criterion
  Behavior
  Development
  Evaluation (See *Criterion Test)
  Frame (See *Terminal Behavior Frame)
  *Objective (See also *Measurement, Criterion Referenced)
  Referenced Measurement (See *Measurement, Criterion Referenced)
  *Test (See also *Terminal Behavior)

Cue (See also *Prompt)
  Attention Habits
  Pattern

Curriculum
  Design
  Development
  Revision

Cutaways

Data
  Analysis
  Collecting
  Flow Analysis
  *Processing

Decision Aid

*Decision Logic Table

*Decision-Making

Delay

Demonstration

Design Guidelines

Design of Instruction

Detail, Amount of

Device

Devices, Instructional

*Diagnostic Test

Diagrams (See *Visual Materials; Graphics)

Dial Access

Dialogue

Difficulty Indices

Difficulty Level

*Diffusion

Discovery

*Discrimination
  Frame (See Frame, Discrimination)
  Learning

Discussion

Displays (See *Visual Materials)

Distortion
  Perceptual
  Speech (See Speech Distortion)

Distributed Practice (See *Practice, Distributed)

Dramatized Experiences (See Role Play)

Drill (See Practice)

Enabling Objective (See *Teaching Step)

Engineering Education (See *Technical Training)

*Enrichment

*Entering Behavior

*Environment

Environmental Media (See *Media, Environmental)

Equipment (See Operational Equipment; Training Equipment) (See also Hardware Aids)

*Error Rate

*Evaluation (See also Measurement)
  Course
  Criterion (See *Criterion Test)
  Instructional Materials (See Materials, Evaluation) (See also Media, Evaluation of)
  *Methods
  Program
  Self- (Self-Evaluation)
  Student
  System (See System Evaluation)

Experience

Experimental Design

Explicitness (See Detail, Amount of)

Extension Course

*Extinction

Facilities (See *Environment)

*Fading

Feasibility Study

*Feedback (See also *Knowledge of Results)
  Augmented
  Confounded
  Direct

Field Survey

*Field Test (See also Testing)

Field Trip

Film (See also Motion Picture)
  Commentary
  Loop Demonstration
  Viewing Practice

Films, Organizational Outline in

*Filmstrip (See also *Media, Instructional)

*Filmstrip Projector

Fixed Procedure

*Flight Training

Follow-Up

*Frame
  Discrimination
  Multiple-Choice
  Practice

G-Factor

Gain

Games (See *Simulation)

*Generalization

Glossary

Graphics

Group
  Discussions
  Instruction
  Pacing (See *Pacing, Group)
  Tryout (See Tryout)

Guided Discovery

*Handbook

*Hardware

Hardware Aids (See also Media; Projector)

High-Fidelity

Human Factors
  Function Allocation
  Human Engineering
  Man-Machine Interaction
  Systems Analysis (See Systems Analysis)
  Task Analysis (See *Task Analysis)

Implementation (See also Management)

Incidental Learning

Independent Study

Indirect Learning

Individual Differences

Individualization
  Partial

Individualized Instruction

*Individually Prescribed Instruction (IPI)

Industrial Training

Information Processing

Information Retrieval

Information Transfer

Innovation

Input Load

Instruction

Instructional Aids (See *Aids, Instructional)

*Instructional Materials Center

Instructional Media (See *Media, Instructional)

Instructional Objective (See *Behavioral Objective)

Instructional Outcomes

Instructional Set

Instructional System.(See *System; *Systems Approach to Training)

Instructional System Development (ISD) (See *Systems Approach to Training) (See also Design Guidelines; Design of Instruction; Systems Method)

Instructor
  Characteristics of
  Effectiveness
  Evaluation
  *Guides for
  Orientation (See Instructor Training)
  Responsibilities
  Role
  Selection
  Training

Instructor's Station

Intelligence

Intentional Learning

Intentions

Interference

Intermittent Reinforcement (See *Reinforcement, Partial)

Interview
  Group
  Individual
  Observation

*Intrinsic Programming (See also *Branch)

Inquiry Mode of Instruction

Irrelevant Information

Isolation

*Job
- Analysis
- Description
- Inventory
- Knowledge Test

Job Performance

*Job Performance Aids (JPA)

*Job Performance Requirements

Job Training

*Kinescope (See also Television)

*Knowledge of Results

*Learner-Centered Instruction (LCI)

Learner Characteristics

*Learner-Controlled Instruction

Learner Resource Center (See *Instructional Materials Center)

*Learning
- Analysis
- Center (See *Instructional Materials Center)
- Curve
- Early
- Facilitation
- Factors Affecting
- Hierarchies
- Laboratories
- Objective (See *Behavioral Objective)
- Principles
- Rate
- Sets
- Theories
- Types (See also Listings of Specific Types of Learning)

Lecture
- Programmed
- *Standard

Lecture-Discussion

Lesson Plan [See *Plan of Instruction (POI)]

Library (See Information Retrieval)

*Linear Programming

Listening

Logistics

Low-Fidelity

Management
- of Research Agencies
- of Students
- of Training Systems

Maintenance Training Device

*Manipulanda (See also Media)

Man-Machine Interaction (See Human Factors, Man-Machine Interaction)

Mass Media

Massed Practice (See *Practice, Massed)

Materials, Evaluation

Materials, Preparation

Materials, Validation

Mathematical Models

*Mathetics

Meaningfulness

Measurement
- *Criterion Referenced
- Instrument
- Methods of (General)
- *Norm Referenced
- *Performance
- *Techniques (See also *Evaluation)

Media
- Characteristics of
- *Communication
- Cost
- Effects of
- *Environmental
- Evaluation of
- *Instructional
- Mass (See Mass Media)
- Preparation
- Resource Center (See *Instructional Materials Center)
- Requirements
- Research in (See Research, Media)
- Selection of
- Types of (See also Listings of Specific Types of Media)
- Utilization of

Methodology
Evaluation (See *Evaluation Methods)
Instruction
Measurement (See Measurement, Methods of)
Selection
Systems (See Systems Method)
Training (See Methodology, Instruction)

Microform (See Printed Material, Microform)

Military
Law
Training

*Mock-Ups (See also Media)

*Mode Analysis

Model (See also Media)
*Hardware
*Schematic or Description

Modules

Motion Picture (See also Media)

Motivation

Motor Skills

*Multimedia Approach

Multiple Choice Questions (See also Frame, Multiple-Choice)

*Multi-Track Course

Negative Reinforcement (See *Reinforcement, Negative)

Non-Decision Aid

Nonsense Syllables

Norm Referenced Testing or Measurement (See *Measurement, Norm Referenced)

Note-Taking

Objective
Behavioral (See *Behavioral Objective)
Criterion (See *Criterion Objective)

Observation Skills

Officer Training (See Military Training)

*On-the-Job Training (OJT)

*Opaque Projector (See also Projector; Media)

Operational Equipment (See also Hardware Aids)

Operational Tryout (See *Field Test)

Optimization Techniques

Optimum Viewing Conditions (See Media Requirements)

*Overhead Projector

*Pacing
Automatic
*Group
Self-

Paired-Associate

Partial Reinforcement [See *Reinforcement, Partial (or Intermittent)]

Participation
Covert
Overt

Participation of Learner

Part-Task Practice (See *Practice, Part-Task)

Pattern of Learning Ability

Perception

Perceptual Learning

Perceptual Motor Skills (See also Motor Skills)

*Performance
Aid
Aid Detail
Aid Format
*Criterion
Job
Measurement (See *Measurement, Performance)
Standards
Test
Training

Periodic Reinforcement (See *Reinforcement Schedules)

Personnel
Assessment
Selection
Training (See Job Training)

Phonograph

Pictorial Test

Picture (See *Visual Materials)

*Plan of Instruction (POI)

Positive Reinforcement (See *Reinforcement, Positive)

*Post-Test

Practice
Covert
*Distributed
Frame (See Frame, Practice)
*Massed
Materials
Overt
*Part-Task
*Whole-Task

Predictive Device

Pre-Film Test (See *Pre-Test)

Presentation Methods

Prestige Rate

*Pre-Test

Principles Learning

Printed Material
Microform
Textbooks

Prior Learning (See *Entering Behavior)

Problem Solving

Procedure
Instructional

Procedures Trainer (See *Trainer) (See also Media, Characteristics of)

Processing, Data (See *Data Processing)

Product Development

Proficiency

Proficiency Level

Profile Analysis

*Program
Density
Evaluation
Instructional
Self-Instructional [See *Auto-Instruction Program, Programmed Instruction (PI)]

Programmed Instruction (PI) [See also *Teaching Machines; *Computer-Assisted Instruction (CAI)]
Editing Techniques
Lecture (See Lecture, Programmed)
*Material
Objective (See also *Behavioral Objective; *Criterion Objective)
Principles
Procedures (See Programming Methods)
Scheduling
System (See *System; *Systems Approach to Training)
Televised (See also Television)
*Text
Tryout (See also Tryout)

Programmed Interaction Objective (See *Behavioral Objective)

Programmer
*Computer
*Programmed Instruction

Programming Methods [See also *Program; Programmed Instruction (PI)]
Adjunct (See *Adjunct Programming)
Branching (See *Intrinsic Programming)
Chaining, Conversational (See Chaining, Conversational)
Chaining, Retrogressive (See Chaining, Retrogressive)
Computer (See *Programmer, Computer)
Instructional [See *Programmed Instruction (PI)]
Intrinsic (See *Intrinsic Programming)
Linear (See *Linear Programming)
Mathetics (See *Mathetics)

Projector
  Film
  Opaque (See *Opaque Projector)
  Overhead (See *Overhead Projector)
  Rear-Screen (See *Rear-Screen Projection)
  Slide (See *Slide Projector)

*Prompt
  Partial

Psychoanalytic Framework

Psychology

Punishment

Qualitative Indices

Quality Control

Questionnaire Survey

Radio

Rate
  Controlled Speech (See *Accelerated Speech; *Rate Expanded Speech)
  Error (See *Error Rate)
  *Expanded Speech (See also *Accelerated Speech)
  Learning (See Learning Rate)
  Time (See Time Factors)

Rating Profile

Reaction Time

Reading

Realism (See also *Simulation)

*Rear-Screen Projection (See also Media)

Reasoning (See Thinking)

Recall (See also Retention)
  Free
  Short-Term

Recognition
  Training

Recording Time

Redundancy

Regression Analysis

*Reinforcement
  Delay of
  *Negative
  *Partial (or Intermittent)
  *Positive
  *Schedules

*Reinforcer (See also *Reinforcement)

Repetition (See Redundancy)

Research
  Media

*Resource

Resource Requirements

*Response
  Code
  Confirmation (See *Knowledge of Results; *Feedback)
  Constructed
  Contingencies
  *Covert (Passive)
  Differentiation
  Error (See *Error Rate)
  Free
  Guidance
  Mediating
  *Mode
  *Overt
  Processes

Retention
  Delayed
  Immediate

Retroactive Inhibition

Review

Role Play

*Scrambled Book

Self-Evaluation

Self-Instructional Program (See *Auto-Instruction Program)

Self-Paced (See Pacing, Self-)

Sequence
  Instructor Generated
  Learner Generated
  Ordered
  Scrambled
  Subconcept

*Sequencing

*Shaping

Signal Detection

*Simulation
    by Computer

*Simulator
    Complexity

*Single Concept Film

Skill Training

*Slide

*Slide Projector (See also Media)

Social Issues

*Software

*Sound/Slide

Speaking

Speech
    Acceleration (See *Accelerated Speech)
    Compression (See *Accelerated Speech)
    Distortion
    Rate
    Rate Expansion (See *Rate Expanded Speech)

Spontaneous Recovery

Statement of Learning Objectives (SOLO) (See *Behavioral Objective)

*Step
   *Size

Stereoscopic Sound Film

*Stimulus
    Characteristics
    Code
    Control
    Complexity (See Stimulus Characteristics)
    Devices
    Differentiation
    Encoding
    Factors
   *Mode
    Presentation
    Uncertainty

Stimulus/Response Factors

Strategies for Instruction [See also *Plan of Instruction (POI)]

Stress

Student Evaluation (See Evaluation, Student)

Subsets

*Subsystem

Supervision

Symbolic Diagram (See *Model, Schematic)

Symbols

Syntax

*System (In General or Instructional)
    Capability
    Engineering
    Evaluation
    Maintainability
    Reliability
    Requirements

Systems
    Analysis
   *Approach to Training
   *Design (in Education)
    Method

Tachistoscope

Tape (See Audio Tape; Videotape)

*Target Population

*Task
   *Analysis
    Classification
    Complexity
   *Description
    Familiarization
    Identification
    Information Content Level
    Inventory
    Repetitive
    Organization
    Overloading
    Performance
    Predictability
    Psychomotor (See Perceptual Motor Skills)
    Statement

Taxonomies

Teacher (See Instructor)

Teaching Effectiveness

Teaching Equipment (See *Aids, Instructional; Devices, Instructional)

*Teaching Machine (See also Device)
  Requirements

*Teaching Step (See also *Criterion Objective)

Team Training

Teams

Technical Conference

*Technical Training

Technique
  Adaptive (See *Adaptive Techniques)

Television
  Educational (ETV)
  Instructional (ITV)
  Instruction Recordings
  Live

*Terminal Behavior
  *Frame

Testing
  Psychometric Methods

Tests
  Achievement (See *Achievement Test)
  Aptitude (See *Aptitude Test)
  Construction
  Criterion (See *Criterion Test)
  Criterion Referenced (See *Measurement, Criterion Referenced)
  Development
  Diagnostic (See *Diagnostic Test)
  Field (See *Field Test)
  Norm Referenced (See *Measurement, Norm Referenced)
  Proficiency
  Question Types
  Reliability of
  Retention (See Retention)
  Threshold Knowledge [See *Threshold Knowledge Test (TKT)]

Tests (continued)
  Scoring
  Self-Scoring
  Validity

Textbook (See Printed Material, Textbooks)

*Threshold Knowledge Test (TKT)

Thinking (See also Cognition)

Time Factors

Time Sharing

Tracking Task

Traditional Teaching (See Conventional Methods)

*Trainer
  Part-Task (See also *Practice, Part-Task)
  Procedural (See *Trainer)
  Whole-Task (See also *Practice, Whole-Task)

Training Center (See *Instructional Materials Center)

Training Equipment
  Selection of

Training Goal (See *Behavioral Objective)

Training Materials
  Media (See *Media, Instructional)
  Method (See Methodology, Instruction)
  Task Fidelity

Training Officer

Training Requirements

*Transfer of Training
  Intermodal
  Mediated
  Negative

*Transparencies

Trials

Troubleshooting

True-False (See Tests, Question Types)

Tryout (See also *Field Test)

Tutorial Mode of Instruction

Typographical Arrangement (See Printed Material)

Unsyntactical Structure

*Validation (See also *Field Test; Tryout)

Verbal
- Ability
- Behavior
- Communication
- Introduction
- Learning

Videotape

Vigilance

*Visual Materials

Visuals, Use of (See also Media, Utilization of)

Whole-Task Practice (See *Practice, Whole-Task)

Work (See *Task)

Writing
- Effectiveness
- Material

APPENDIX V

GLOSSARY

GLOSSARY

Accelerated Speech	Recorded speech which, by one of a variety of techniques has been compressed (e.g., by compressing pauses and shortening vowels) to permit presentation at a faster rate then normal speech. Accelerated speech has been reproduced at rates up to 400 wpm while still providing satisfactory comprehension and retention. See also Rate Expanded Speech.
Achievement Test	A test for measuring an individual's progress in the mastery of a subject to be learned.
Adaptive Techniques	Any of several techniques used in programming to accommodate individual differences. It may permit the student to by-pass material he already knows or may provide him additional instruction as needed. See also By-passing, Branching.
Adjunct Programming	A programming technique in which the instructional program supplements a handbook, technical order, regulation, or other source of information. The program is intended to instruct the student in the use of the material it supplements or to expand upon the content of the material it supplements. Presumably, once the student has completed the "adjunct" program, the main body of information can stand on its own. See also Intrinsic, Linear, and Mathetics Programming.
Advance Organizer	An introductory statement that describes the general concepts and materials to be covered during instruction. A technique commonly used is to present a student with a list of the behavioral objectives which describe what he will be able to do at the end of instruction.
Aid, Job Performance	See Job Performance Aids (JPA)
Aids, Instructional	Devices which assist an instructor in the teaching-learning process by simply presenting supporting or supplementary material usually intermittently. They are not self-supporting. The key fact is that aids support, supplement, or reinforce. See also Media, Instructional, Media, Communication, and Media, Environmental.

Aptitude Test	A test or battery of tests designed to show a person's capacity for a particular type of behavior in a single field or in several related fields.
Association	The connection made between a stimulus (input) and a response (action).
Audio Materials	Those instructional materials which communicate via sound, e.g., cassettes, cartridges, and other audio tape recordings.
Audio-visual Media	Devices that employ visual and auditory aids to learning, including motion pictures, television, sound filmstrips, and slide/sound sets.
Auto-instruction(al) Device	Systems and machines, including individual reading pacers, individual viewing and listening equipment, language laboratories, programmed printed materials, and teaching machines designed to present a program of instruction without the aid of a live instructor.
Auto-instruction(al) Program	Synonymous with programmed instruction, automated teaching, self-instructional materials, etc.
Baseline Data	A compilation of statistical evidence which is used as a representative of an achievement or a behavioral pattern before any new instructional process is introduced. It becomes the foundation against which the results of new instructional processes will be measured and compared to determine improvement in performance time, cost, manpower, etc.
Behavioral Objective	Also called instructional objective, learning objective, programmed instruction objective, and Statement of Learning Objective (SOLO). An explicit statement that describes the educational intent of a segment of instruction. The statement(s) must describe what the learner will be DOING when demonstrating the terminal behavior and must (1) identify and name the overall behavior act; (2) define the important conditions under which the behavior is to occur (givens or restrictions or both); and (3) define the criterion of acceptable performance. The statement of objectives for an entire course of instruction will consist of a number of specific statements.

Branch	In programmed instruction, a point of choice at which students are sent to alternative items depending on their responses to the particular item. See also Intrinsic Programming and By-passing.
By-passing	A technique which permits a student to skip certain portions of the programmed materials because of prior knowledge. A criterion item may be inserted in a linear program and, if the student passes it, he is sent forward several items (by-passing); if he fails the criterion item, he takes an intervening sequence of review or remedial items.
Chaining	The linking together of a series of discriminable responses in a particular order. The completion of the first responses provides the stimulus for the second response.
Communication Media	See Media, Communication.
Computer-Assisted Instruction (CAI)	The technique of using a computer program with necessary central and terminal equipment to instruct a student. The computer controls the material presented to the student and selects the next step on the basis of the student's response. CAI employs the intrinsic (branching) method of programming. See also Teaching Machine and Intrinsic Programming.
Computer-Managed Instruction (CMI)	CMI uses a computer to administer the instructional process but relies on conventional or multi-media hardware and software. The student is on-line for testing, diagnosis, and prescription only.
Concept	(1) Any object of awareness together with its significance or meaning; anything one can think about that can be distinguished from other things. (2) A general meaning, an idea, or a property that can be predicted of two or more individual items. (3) Knowledge that is not directly perceived through the senses but is the result of the manipulation of sensory impressions.
Confirmation	Notification to the student of the correctness of his response immediately after his response.
Constructed Response	An answer requiring recall or completion as opposed to recognition, e.g., drawing a diagram; filling in a form; labeling the parts of a piece of equipment; writing a sentence, paragraph, or essay.

Cost-effectiveness	A comparative evaluation derived from analyses of alternatives (actions, methods, approaches, equipment, weapon systems, support systems, force combinations, etc.) in terms of the interrelated influences of cost and effectiveness in accomplishing a specific mission or objective.
Criterion Evaluation	See Criterion Test.
Criterion Frame	See Terminal Behavior Frame.
Criterion Objective	Criterion objectives specify precisely what behavior is to be exhibited, the conditions under which behavior will be accomplished, and the minimum standard of performance. Criterion objectives describe only the behaviors which directly lead to or specifically satisfy a job performance requirement or standard. Thus they are differentiated from the more general term, "behavioral objective."
Criterion Test	Test to determine if terminal behavior as reflected in terminal objectives has been acquired. May involve multiple-choice items, fill-in items, essays, or actual performance of a task. If given immediately after learning sequences, it is a test of acquisition; if given considerably later, it is a retention test. See also Measurement, Criterion Referenced and Measurement, Norm Referenced.
Cue	See Prompt.
Data Processing	The preparation and handling of information by procedures that classify, sort, calculate, summarize, and record. These procedures may be manual, mechanical, or electronic.
Decision Logic Table	Guide to assist in the decision-making process. Represents the inputs or set of inputs likely to occur for a given situation and recommends a course of action or, if appropriate, alternative actions. Also called Decision Table.
Decision-making	Choosing a course of action on the basis of facts, opinions, and other information relevant to the decision.
Diagnostic Test	Attempts to identify specific student learning problems or determine whether students are progressing satisfactorily towards a particular instructional objective.

Diffusion	Describes four types of activities which include (1) dissemination (the act of dispersing and spreading educational ideas, information, and products); (2) promotion (the act of obtaining interest and commitment to the new idea, information, or products); (3) infusion (the act of introducing the product into the operational setting; and (4) sustainment (the act of insuring continued use of the new product).
Discrimination	Learning to make different responses to similar stimuli. A discrimination item is one which requires the student to determine the differences among inputs.
Distributed Practice	See Practice, Distributed.
Enrichment	Supplementary material which aids the student in progressing through the course but is not considered crucial to learning.
Entering Behavior	Past educational achievement of the target population. Includes information about school performance, school completion, type of training received, instruction patterns, and test scores. Sometimes includes other information which may be relevant to development plans such as social/economic status, ethnic/racial background, and physical/psychological deviations.
Environment	The sum of the external conditions and factors within an instructional situation potentially capable of influencing a student, e.g., lighting, furniture, temperature, color.
Environmental Media	See Media, Environmental.
Error Rate	Generally the percentage of incorrect responses on an item, a set of items, or a whole program.
Evaluation	Procedure to determine the effectiveness of the performance of an instructional product or process in order to ascertain specific causes for the effectiveness or lack of it, and to make decisions appropriate to the extent of the effectiveness.
Evaluation Methods	Include methods (test, interview, etc.) used to assess student performance after completion of a course of instruction and to assess instructor performance, effectiveness of a training aid, etc.
Extinction	The weakening of the tendency to make a response by not reinforcing the response when it occurs.

Fading	The progressive diminishing of prompts within a teaching sequence so that all prompting is absent from the terminal frame. Sometimes used as a synonym for vanishing. See also Prompt; Terminal Behavior Frame.
Feedback	Information which results from or is contingent upon an action. The feedback does not necessarily indicate the rightness or wrongness of an action. See Knowledge of Results. Rather it relates the results of the action from which inferences about correctness can be drawn. Feedback may be immediate, as when a fuse blows because a lamp was incorrectly wired, or delayed, as when an instructor provides a discussion pertaining to an exam taken the previous week.
Field Test	Tryout of any training course on a representative sample of the target audience to gather data on the effectiveness of instruction in regard to error rates, criterion test performance, and time to complete the course.
Filmstrip	Also called strip film and slide film. A length of 35mm or 16mm film containing a succession of still pictures intended for projection one at a time in the same way as slides are shown. Some filmstrips are equipped with a tape or a recording that contains not only the narration but also a subsonic signal that activates a solenoid to advance the filmstrip to the next picture on cue.
Filmstrip Projector	Projection instrument designed to accept 35mm filmstrips either vertically or horizontally. It is often equipped with an adapter to accept slides. Models are available with manual, remote control, or automatic advance.
Flight Training	That portion of military training devoted to acquisition of all flying skills, including navigation, meteorology, piloting, etc.
Frame	In programmed instruction a segment of material which the student handles at one time. An item may vary in size from a single incomplete sentence, question, or instruction to perform some response, up to a sizable paragraph. In almost all programming methods it will require at least one response and will provide for knowledge of results before the student proceeds to the next item. See also Step.

Generalization	Learning to respond to a new stimulus similar, but not identical, to one that was present during original learning.
Group Pacing	See Pacing, Group.
Handbook	A reference, guide, or prescriptive manual which covers all or part of a process or performance.
Hardware	The physical components of a system (usually electronic or electrical devices) which are utilized in educational processes including computers, terminals, audiovisual devices, teaching machines, etc. See also Software.
Individually Prescribed Instruction (IPI)	A course of study or program fitted to the individual learner's background, abilities, and training needs, in which the learner selects his own materials and proceeds at his own pace.
Instructional Aids	See Aids, Instructional.
Instructional Materials Center	Also called Learning Center or Resource Center. A learning environment which has been specifically developed to foster individualized instruction and which emphasizes employment of media, including computers, to augment textbooks and manuals.
Instructional Media	See Media, Instructional.
Instructional Objective	See Behavioral Objective.
Instructional System	See System and Systems Approach to Training.
Instructional System Development	See Systems Approach to Training.
Instructor, Guides for	Publications designed to provide the administrator of instructional materials with information about the objectives of the materials, the procedures involved in their development, suggestions for their optimal use, and descriptions of what might be expected from the materials, based on their previous effectiveness.
Intrinsic Programming	A programming technique developed by Norman Crowder, characterized by rather lengthy items, multiple-choice responses, and consistent use of branching. If, after reading the information section of each item, the student selects the correct response, he is sent to

	an item presenting new information. If he selects an incorrect alternative, he is sent to an item which provides information as to why his choice was incorrect. See also Branch; Adjunct, Linear, and Mathetics Programming.
Job	The composite of duties and tasks actually performed by an individual.
Job Performance Aids (JPA)	Devices, books, charts, or other references which facilitate job performance by reducing the amount of information the human performer must recall or retain in order to successfully carry out a task. The pictorial guide on a movie projector showing the path for threading the film is a job performance aid for the projectionist.
Job Performance Requirements	The tasks required of the human component of a system, including the associated standard of performance.
Kinescope	Motion picture films made by photographing the images produced on a television picture tube.
Knowledge of Results	A report to the student on the correctness of the response. It may be verbal report such as "right" or "wrong" or a display (verbal or visual) of the correct response.
Learner Centered Instruction (LCI)	An instructional process following Instructional Systems Development procedures to insure direct job relevancy of the learning materials. For example, an LCI approach to electronics maintenance training would not contain only the traditional fundamentals of electronics required for satisfying the job performance requirements.
Learner Controlled Instruction	Involves an instructional environment in which the student has a variety of instructional options that can be selected for achievement of the terminal objectives. Students can vary their rate of learning, the media used, etc.
Learning	A change in behavior as a result of experience. The behavior can be physical and overt, or it can be intellectual or attitudinal.
Learning Objective	See Behavioral Objective.
Lecture, Standard	A discourse given before an audience or class for instructional purposes.

Linear Programming	A programming technique in which set sequences of frames in small units require a response from the student at each step. The steps are so designed that errors will be minimal for even the slower students in the target audience. Each student does each item in the program, his progress differing only in rate at which he proceeds through the sequence. See also Adjunct, Linear, and Mathetics Programming.
Manipulanda	Physical objects designed to be handled by students for instructional purposes.
Massed Practice	See Practice, Massed.
Mathetics	A programming method that stresses the analysis and arrangement of subject matter and the systematic application of scientific training techniques. Four technical phases of mathetics are the task analysis, prescription of behavior (statement of objectives), characterization of the prescription (detailed analysis of behavior to be taught and strategy to be used), and exercise writing.
Measurement, Criterion Referenced	The process of determining, as objectively as possible, a student's achievement in relation to a fixed standard based on criterion objectives. See also Criterion Objective.
Measurement, Norm Referenced	The process of determining a student's achievement in relation to other students. Grading "on the curve" involves norm referenced measurement since an individual's position on the curve (grade) depends on the performance of other students.
Measurement, Performance	The process of determining if the student's performance on a given task reaches the criterion level set as the standard for that specific task.
Measurement Techniques	Techniques for measurement of student learning may include: quizzes, pre- and post-tests, self-evaluation, instructor evaluation, etc.
Media, Communication	Systems or instruments which present a complete body of information and are largely self-supporting rather than supplementary to the teaching-learning process. Communication may be one-way (e.g., television, films, slide/tape presentations) or two-way response media (e.g., programmed instruction, CAI). See also Aids, Instructional; Media, Instructional; and Media, Environmental.

Media, Environmental	Equipment, devices, or situations which create an artificial environment that will realistically stimulate a learner and react to his responses (actions or manipulations), thus providing practice in relatively complex behaviors that require special environment. The environment simulated may be applied to (1) concrete and self-contained systems such as airplanes and automobiles, (2) more abstract systems such as the national economy of a country, or (3) real-life person or persons with whom the student is being trained to interact. See also Aids, Instructional; Media, Instructional; and Media, Communication.
Media, Instructional	Any component of the instructional system which presents or provides stimuli to the learner. See also Media, Communication; Media, Environmental; and Aids, Instructional.
Mock-ups	Representations of the real thing, constructed so as to emphasize the particular function of the real thing. They may be smaller or larger than the original; parts of mock-ups may be operational or non-operating; certain features may be made so as to give emphasis to functions or relationships.
Mode Analysis	The analytical process by which characteristics of behavioral objectives are examined to determine the nature of the stimulus mode required to teach the objective. The primary modes are audio, visual, and sensori-motor.
Model, Hardware	A scale replica or representation of reality. The scale may be miniature, exact size, or enlargement, and the model itself may or may not be manipulative.
Model, Schematic or Description	A demonstration of the performance or graphic aid which the student is to use as a standard or example (a model) to guide his performance.
Multimedia Approach	Depends on the use of more than one type of instructional medium as a vehicle for presenting the instructional materials. Characteristically, an instructional package which employs a multimedia approach may use textbooks, films, slides, and manipulanda to present various segments of the entire package.
Multi-track Course	A course which employs more than one track or channel of instruction. Course goals are the same on all channels, but course content,

	degree of instruction, and presentation all vary to accommodate students of different aptitudes and levels of previously acquired skills and knowledges.
Negative Reinforcement	See Reinforcement, Negative.
Norm Referenced Testing or Measurement	See Measurement, Norm Referenced.
Objective, Behavioral	See Behavioral Objective.
Objective, Criterion	See Criterion Objective.
On-the-Job Training (OJT)	On-the-Job Training is a systematic application of self-study and the craftsman-apprentice principle, characterized by the trainee's being permitted to practice on operating equipment, with supervision by a knowledgeable worker and/or instructor.
Opaque Projector	A projector which can project small non-transparent images, such as maps, pictures, or printed pages, onto a screen as enlargements.
Overhead Projector	A device which throws a highly-illuminated image on a screen by reflection from a mirror; it is placed in front of the audience and may be used in a semi-darkened or completely lighted room; utilizes 3-1/4" x 4", 7" x 7", and 10" x 10" transparencies and specially prepared objects which may be produced and presented in a variety of ways.
Pacing	The rate at which the student proceeds through a given number of items. The usual procedure in programmed instruction is self-pacing--the student reads and responds at his own rate. If materials are presented by such means to a group, the time allowed for input and for response must be standardized through group-pacing. See also Pacing, Group.
Pacing, Group	A procedure in which students progress together toward the same objectives; often employed where self-pacing is not practical for administrative reasons.
Partial Reinforcement	See Reinforcement, Partial (or Intermittent).
Part-task Practice	See Practice, Part-task.

Performance	The carrying out of an act to completion; actual accomplishment of a task to some preset standard of completeness and accuracy.
Performance Criterion	A standard used to determine whether or not the student has achieved a satisfactory level of performance. Sixty words per minute is the usual criterion for satisfactory performance as a typist.
Performance Measurement	See Measurement, Performance.
Plan of Instruction (POI)	A qualitative course control document designed for use primarily within an Air Force School for course planning, organization, and operation. Generally, for every block of instruction within a course, criterion objectives, duration of instruction, and suport materials/ guidance factors are listed.
Positive Reinforcement	See Reinforcement, Positive.
Post-test	A test given to a student upon completion of a course of instruction to measure learning achieved. See also Pre-test.
Practice, Distributed	During learning, the process of spacing numerous, relatively short, practice sessions throughout the learning period. See also Practice, Massed.
Practice, Massed	During learning, the process of providing all practice sessions at a specific point in the learning period (usually at the end of instruction). This is generally considered inferior to distributed practice. See also Practice, Distributed.
Practice, Part-task	An exercise, performed with or without a training device, which allows students to practice some portion of a task or set of tasks. See also Practice, Whole-task.
Practice, Whole-task	An exercise, performed with or without a training device, which allows students to practice an entire task at one time. See also Practice, Part-task.
Pre-test	A test given to a student prior to entry into a course of instruction to determine the technical skills and knowledges (entering behavior) he possesses in a given subject. See also Post-test.

Program	A sequence of planned steps or increments which leads the student to mastery of the subject while minimizing uncontrolled error. The student is required to actively respond to each step and is given immediate feedback as to the correctness of his response. The distinguishing characteristic of programmed materials is the testing procedure to which they are subjected. Empirical evidence of the effectiveness of each teaching sequence is obtainable from the performance records of students. See also Intrinsic Programming and Linear Programming.
Programmed Instruction(al) (PI) Material	Instructional material prepared specifically to employ techniques of programming. Synonymous with auto-instruction, automated teaching, etc. See also Program.
Programmed Instruction (PI) Text	A book in which a program is usually printed in one of three typical formats: page-to-page, down-the-page, or scrambled. In the first type, the student turns the page after each frame or item, finding the answer and the next item on the following page. Generally, items are arranged in levels. The student goes through the book doing all the items on one level, then repeats the process for each successive level. A down-the-page format requires the student to mask the answer column and in some cases everything but the item he is working on as he reads down the page. See also Scrambled Book.
Programmed Interaction Objective	See Behavioral Objective.
Programmer, Computer	Individual who prepares instruction sequences and who develops the step-by-step operations which are to be performed by the computer in order to solve a problem.
Programmer, Programmed Instruction	The person responsible for the design of items and sequences in a program. The programmer may be a psychologist working with a subject-matter expert who delineates the content, or he may be a subject-matter specialist trained in programming techniques.

Prompt	A stimulus added to the terminal stimulus to make the correct response more likely while the student is learning. It may be pictorial or verbal. It may vary in strength, i.e., provide a model of the response which the student copies (e.g., "Watch me and then do the same.") or provide a cue or hint of a weaker sort (e.g., "The opposite of black is _____.").
Rate Controlled Speech	See Accelerated Speech; Rate Expanded Speech.
Rate Expanded Speech	Recorded speech which, by one of a variety of techniques, has been slowed down without changing the pitch. Expanded speech has been used effectively with slow learners. See also Accelerated Speech.
Rear-screen Projection	A procedure in which a projector is located behind a translucent screen, which is placed in front of the viewers. The projector may be housed in a self-contained unit or in a projection room. Because a mirror system adapted to the projector bends the beam and reverses the image from left to right, the procedure is also called indirect projection.
Reinforcement	The strengthening of the probability of recurrence of a response in a stimulus situation by following the response with a reinforcer. See also Extinction; Reinforcement, Negative; Reinforcement, Partial; Positive Reinforcement; Reinforcer; Reinforcement Schedules.
Reinforcement, Negative	Removal of an aversive stimulus, contingent upon a response (e.g., escape from an unpleasant situation by taking some action) resulting in the increase of the likelihood of future responses.
Reinforcement, Partial (or Intermittent)	A pattern according to which only part of the responses are followed by reinforcement; e.g., when using a slot machine the user gets a payoff only part of the time. See also Reinforcement Schedules.
Reinforcement, Positive	Application of a positive (welcome) stimulus following a response to strengthen the probability of the response's being made again.

Reinforcement Schedules	The contingencies on which reinforcement depends. For Interval Schedules, the first response at the end of a specified interval time is reinforced, but none of the responses within the interval. For Ratio Schedules, the first response at the end of a specified number of responses is reinforced (e.g., each 40th response is reinforced). For Variable Schedules, reinforcement varies about some mean interval of time (variable interval) or about some mean number of responses (variable ratio). The simplest schedule is Continuous Reinforcement in which a reinforcer is given for every response.
Reinforcer	A class of events which, when response, strengthens the tendency for that response to occur. See also Extinction; Reinforcement, Negative; Positive Reinforcement; Reinforcement.
Resource	In instruction, any materials, agencies, activities, or persons that may be utilized to provide learning experiences or in the development of learning experiences.
Response	Generally, any activity which is induced by a stimulus. In instruction, it designates a wide variety of behavior which may involve a single word, selection among alternatives (multiple choice), the solution of a complex problem, or the non-verbal manipulation of buttons, keys, etc.
Response, Covert (Passive)	An internalized response which the student presumably makes but which is neither recorded nor otherwise available to an observer (e.g., a student thinks of a response).
Response Mode	The manner in which a student responds, e.g., writing a sentence, selecting an answer from a group of choices, repairing a piece of equipment, etc.
Response, Overt	A student's oral, written, or manipulative act which is, or can be, recorded by an observer.

Scrambled Book	A form used to present an intrinsically programmed text. In such a book, the student reads a portion of material and selects an answer to a multiple-choice question based on the material. The answer selected determines the page within the book to which the student is then directed for comment on the accuracy or inaccuracy of his choice. Pages are shuffled or scrambled so that the student cannot detect right answer pages by their relative placement.
Self-instructional Program	See Auto-instructional Program.
Sequencing	Arranging a series of frames, items, or experiences directly related by subject or by underlying thought.
Shaping	Reinforcement of successive approximations, starting with behavior that is already present (e.g., questions the student can answer already). Gradual presentation of more difficult material demanding more sophisticated answers.
Simulation	A technique in which a real and complicated process is represented by a simplified model that retains the appearance of reality but permits more "experimentation."
Simulator	Any machine or apparatus that represents a realistic condition or set of conditions, generally more nearly representative of the real world than trainers. See also Simulation.
Single Concept Film	Usually a relatively short (less than 10 minutes) film prepared for review or instruction pertinent to a single topic or item of a course. For example, effective single concept films have been prepared to depict the visual and auditory cues relevant to aircraft spins.
Slide	A mounted transparency either 2" x 2" or 2-1/4" x 2-1/4" and designed for use with a slide projector.
Slide Projector	Projection instrument designed to accept 2" x 2" or 2-1/4" x 2-1/4" mounted transparencies. Slides may be advanced individually or in a cartridge through manual or remote controls.
Software	The technical data, programs, and language components of an educational system, as opposed to the hardware components. The computer and terminal are the hardware, the computer program is the software.

Sound/Slide	A series of slides with a short prerecorded audio presentation for each picture. The slides can be manually advanced or automatically advanced by a signal (usually an audible or inaudible tone on the sound portion) which is recorded during preparation of the presentation.
Speech, Acceleration	See Accelerated Speech.
Speech, Compression	See Accelerated Speech.
Speech, Rate Expansion	See Rate Expanded Speech.
Statement of Learning Objective (SOLO)	See Behavioral Objective.
Step	A portion of material to which the student makes a response. It is a stage in the instructional process that represents progress in the student's mastery. A subject to be taught is broken down into frames, items, or segments (steps). It is assumed that students cannot take later steps in a given sequence before taking the earlier step and that each segment or item represents a step forward. See also Step size; Frame.
Step size	An indefinite, intuitive basic concept in programmed instruction. The size of a step is not necessarily related to the size of a response--a lengthy response may represent only a small step forward--nor is it necessarily related to the amount of material contained in a step. If students cannot respond to an item, that item is considered "too large a step." Generally an increase in the number of items tends to reduce the size of the steps. See also Step; Frame.
Stimulus	Any sensation, significant in that it elicits or controls an activity. In instruction, the input which elicits a response.
Stimulus Mode	The manner in which the stimulus relevant to chaining is perceived through the senses (i.e., visual, auditory, tactile, anesthetic, olfactory, taste, or any combination of senses such as audiovisual).
Subsystem	A major functional subassembly or grouping of items or equipment which is essential to the operational completeness of a system.

System (Instructional)	An integrated, programmed complex of instructional media, machinery, and personnel whose components are structured as a single unit with a schedule of time and sequential phasing. Its purpose is to insure that all required components will be available with the proper characteristics at the proper time to contribute to the total instructional process and in so doing to fulfill the goals which have been established.
System (in general)	The composite of equipment, skills, techniques (includes all related facilities, equipment, materials, services, and personnel) that is capable of performing and/or supporting an operational role. Systems are characterized by a defined purpose (function, mission or objective) which has been carefully analyzed and by identifiable inputs and coordinated processes yielding desired outputs.
Systems Approach to Training	Depends on educational objectives clearly stated before instruction begins, a description and analysis of the tasks necessary for achieving the stated objectives, evaluation procedures to determine whether or not the objectives have been reached, and methods for revising the process based on empirical data. Emphasis is on what has been learned (results achieved) rather than in resources and processes. This term means the same thing as Instructional System Development (ISD).
Systems Design (in education)	Provides a conceptual framework for planning, orderly consideration of functions and resources including personnel and technical facilities, the kinds and amount of resources needed, and a phased and ordered sequence of events leading to the accomplishment of specified and operationally defined achievements. Should provide continuous feedback on the relation of performance of all components to factors of economy and should reveal any inadequacies of the several components and, consequently, of the entire system.
Target Population	The persons for whom the instructional or training materials are designed. Samples from this population are used in evaluating programmed materials during their development.
Task	A unit of work activity or operation that constitutes a logical and necessary step in a performance.

Task Analysis	An analytic technique to help the instructional technologist design the learning materials. The technique involves: (1) identification of the component behaviors (inputs/actions/outputs) which when chained together make up a criterion behavior, and (2) identification of the discreet bit of behavior which constitutes the criterion behavior. Intended to identify inputs to be discriminated or generalized, the input/action associations which must be made and the sequence in which inputs, actions, and outputs are chained together.
Task Description	A written description, usually in outline, which describes the terminal behavior at the highest level of generality. The description is intended to provide an overview of the total performance including normal activities and contingencies.
Teaching Machine	A device that presents a program. The machine usually controls the material to which the student has access, contains a response mechanism, contains provision for knowledge of results, and may score and tabulate results. See also Computer-Assisted Instruction.
Teaching Step	Sometimes referred to as enabling objectives, they are the means whereby students obtain the skills and knowledges required for the successful accomplishment of a criterion objective. See also Criterion Objective.
Technical Training	One of four major responsibilities of the Air Training Command (ATC). Includes over 500 separate technical courses taught at five ATC Technical Centers.
Terminal Behavior	The behavior the student is expected to have acquired at the end of a course of instruction. Evidence that such behavior has been acquired is provided by successful responses to Terminal Behavior Items or criterion tests. See also Criterion Test.
Terminal Behavior Frame	Item(s) at the end of instruction that contain no prompts. Intended to give evidence that terminal behavior has been acquired.
Threshold Knowledge Test (TKT)	The TKT is used prior to the development of an instructional system. It is administered to a sample of prospective students to determine what skills and knowledges should be put into the course of instruction.

Trainer	A performance-oriented device designed to simulate conditions inherent in the equipment which it represents. See also Simulator.
Transfer of Training	The degree to which materials learned in the instructional situation, extend, generalize or apply to the job situation.
Transparencies	Transparent materials designed for projection to facilitate enlargement of the image. Originally associated with 2" x 2" and 3-1/4" x 4" slides, the term is now more popularly associated with 7" x 7" and 10" x 10" slides used with overhead projectors.
Validation	For each step of instructional system development the checking of student performance by careful sampling from the potential student population and tryout of materials to insure performance criteria are satisfied. The system is developed unit by unit and tested (or validated) on the basis of the criterion objectives prepared for each unit.
Visual Materials	Those instructional materials which communicate primarily through sight, e.g., projected pictures, charts, maps.
Whole-task Practice	See Practice, Whole-task.

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